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PESTICIDES ABSTRACTS (formerly Health Aspects of Pesticides Abstracts Bulletin) is a monthly publication of the Management Support Division of the Office of Pesticides and Toxic Substances, Environmental Protection Agency

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides as defined in the Table of Contents. The publication represents a monthly review of more than 2,000 primary and secondary sources. A list of periodicals from which articles have been abstracted appears annually in the January issue. Subjects and authors of abstracted articles are cross-referenced in quarterly and annual indexes. Reprint requests should be directed to the author of the complete article.

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81-0901. Miranowski, J. A. (Dep. Econ., Iowa State Univ., Ames, IA) **Estimating the relationship between pest management and energy prices, and the implications for environmental damage.** *Am. J. Agric. Econ.* 62(5): 995-1000; 1980 (19 references).

A study of the relationship between pest management and energy prices, and the implications for environmental damage, is presented. Practices in corn production are used as examples of pest control. Data on treatment for corn rootworm (CRW) are used to assess the potential for improved management systems. It is suggested that a positive correlation exists between fuel prices and herbicide treatment. These factors contribute to the necessity for sound pest management choices as energy costs continue to rise. As energy prices rise, weed and insect control will be substituted for energy subsidy (fuel inputs) in corn production. Also, information (monitoring) services will be substituted for insecticide inputs in corn production. Corn rootworm control strategies impacted by rising fuel costs will be assessed by systems analysis. It is concluded that the impacts on environmental quality are ambiguous, because it cannot be ascertained if the pesticide for energy substitution will be offset by the information for pesticide substitution.

81-0902. Shahar, E.; Barzilay, Z.; Aladjem, M. (Pediatr. Intensive Care Unit, Chaim Sheba Med. Cent., Tel-Hashomer, Israel) **Paraquat poisoning in a child: vitamin E in amelioration of lung injury.** *Arch. Dis. Child.* 55(10): 830-831; 1980 (6 references).

In this letter-to-the-editor a case of a 3-yr-old boy who had swallowed a mouthful of 20% paraquat solution is described. Treatment consisted of forced diuresis, stomach lavage with fuller's earth, hemodialysis, and hemoperfusion with coated charcoal followed by peritoneal dialysis. The patient lapsed into a semicomatose condition for 2 days, and upon regaining full consciousness, suffered respiratory distress (increased respiratory rate with perioral cyanosis). Treatment consisted of oxygen and daily im injection of vitamin E (200 mg/day) for 4 days. One wk after admission the patient was asymptomatic. It is noted that paraquat toxicity is related to the production of superoxide radicals and hydrogen peroxide, which produce tissue and lipid cellular membrane damage. Vitamin E is apparently effective since it acts as an antioxidant by trapping free radicals.

81-0903. Somogyi, J. C. (Author address not given) **Preface.** *Bibl. Nutr. Dieta* 29: vii-viii; 1980.

This issue includes papers presented at the 16th Symposium of the Group of European Nutritionists in Budapest. The subject of the symposium was foreign substances and nutrition. Topics covered in the papers include interactions between pesticides and nutrition, the toxic effects of trace elements (Hg, Pb and Cd), and the relationship of nutrients, food additives and contaminants to cancer. Abstracts of papers from the symposium will be included in the appropriate sections of this issue of *Pesticides Abstracts.*

81-0904. Berger, S.; Pardo, B.; Skorkowska-Zieleniewska, J. (Inst. Human Nutr., Warsaw Agric. Univ., Warsaw, Poland) **Nutritional implications of pesticides on foods.** *Bibl. Nutr. Dieta* 29: 1-10; 1980 (21 references).

A report on the nutritional implications of pesticides in foods is presented. The benefits of pesticide use in food production include the protection of human, animal and plant health, increased food production, and prevention of food loss during storage. Pesticides may also destroy beneficial flora and fauna, contaminate the natural environment, and accumulate in the food chain. Data on DDT residue levels in food in Poland are presented in tabular form. The influence of food processing of pesticide residues (DDT, carbaryl, dieldrin, BHC and disulfoton) in foods is considered. The influence of herbicide use on nutrient levels in vegetables is presented in graphic form. The FAO/WHO Committee for Pesticide Residues has assisted the international food trade by setting controls on residue levels in foods. The committee performs studies to determine which pesticides require further study, then develops safe limits for pesticides. A more complex approach to pesticide use combining the use of chemical methods, biological resistance, chemosterilants, insect hormones and biopreparations is recommended.

81-0905. Darr, S.; Machado, V. S.; Arntzen, C. J. (DOE Plant Res. Lab., Michigan State Univ., East Lansing, MI 48824) **Uniparental inheritance of a chloroplast Photosystem II polypeptide controlling herbicide binding.** *Biochim. Biophys. Acta* 634(1): 219-228; 1981 (35 references).

The ability of atrazine to inhibit Photosystem II electron transport and the rate of electron transfer from the primary to the secondary quinone electron acceptors in the Photosystem II complex were examined in triazine-resistant and -susceptible parental biotypes of *Brassica campetris* L. and their F_1 progeny derived from reciprocal crosses. The lack of herbicide inhibitory activity and the presence of functional properties which decreased the Q^- to B electron transport rate constant were inhibited in parallel through the maternal parent. We conclude that the herbicide receptor protein is uniparentally inherited through the female parent. These data are discussed in relation to other studies which indicate that the binding site is a 32,000-dalton polypeptide which determines the functional properties of B (the secondary Photosystem II electron acceptor). (Author abstract by permission)

81-0906. Igumenov, V. L.; Etngof, R. N. (M. I. Sechenov Inst. Evol. Physiol. & Biochem., Leningrad, USSR) **Fosfodiesteraza tsiklicheskikh nukleotidov iz prorostkov pshenitsy. Ochistka, svoistva, vliianie sistemnykh fungitsidov. [Phosphodiesterase of cyclic nucleotides from wheat shoots. Purification, properties, and effect of systemic fungicides.]** *Biokhimiya* 45(10): 1797-1803; 1980 (24 references) (Russian).

The results of isolation and purification of cyclic nucleotide phosphodiesterase from wheat shoots are reported. All systemic fungicides tested were found to inhibit activity of the enzyme. The most pronounced inhibition was recorded in the range of fungicide concentration of 0.5-2.5 m*M*. With respect to inhibition, fungicides could be arranged in the following order: Anilate > benomyl > Vitavax (carboxin) > Plantvax (oxycarboxin). The inhibitory effects ranged from 65% for Anilate to 40% for benomyl and 20% for Vitavaz and Plantvax.

81-0907. Ogbuehi, S. N.; Leavitt, J. R. C.; Brandle, J. R. (Inst. Agric. & Nat. Resour., Univ. Nebraska, Lincoln, NE 68583) **Reflectorized soybean canopy in relation to transpiration and herbicide phytotoxicity.** *Bull. Environ. Contam. Toxicol.* 25(6): 879-883; 1980 (12 references).

Experiments were carried out to determine the ability of kaolinite (an inert white material) applied as a reflectant to reduce soybean transpiration and the phytotoxicity of the herbicides atrazine and picloram. Soybean plants were maintained in a heated greenhouse, and the adaxial surfaces of all leaves were painted with a kaolinite solution. Two days later, soil surfaces were treated with atrazine (0.01-0.40 μg/g) or picloram (0.001-0.03 μg/g). Air temperature, irradiance in the greenhouse, and leaf temperatures were determined at regular intervals, and dry wt of soybean plants were determined after 10 days. In transpiration studies untreated plants showed higher transpiration rates than reflectant-treated plants. Transpiration was also higher when mean air temperature and irradiance were higher. Reflectant treatment resulted in lower leaf temperatures. Phytotoxicity due to the herbicides was decreased in reflectant-treated plants, due to the decrease in leaf temperature and transpiration.

81-0908. Dahl, F. H.; McDonald, R. B. (Sea Lamprey Control Stn., US Fish & Wildl. Serv., Marquette, MI 49855) **Effects of control of the sea lamprey (*Petromyzon marinus*) on migratory and resident fish populations.** *Can. J. Fish. Aquat. Sci.* 37(11): 1886-1894; 1980 (26 references).

Information from the records of the various agencies on control of the sea lamprey (*Petromyzon marinus*) was summarized from the early approach to control by mechanical or electrical barriers and chemical toxicants. While fish kill has been an inescapable consequence of the program, information available for migratory species has shown no large-scale detrimental effects. The only reportable instances of damage to a resident stream species has been the near loss of the stonecat (*Noturus flavus*) from tributaries to the southwest corner of Lake Superior, resulting from chemical treatments. Although no similar occurrences were recognized, available documentation proved inadequate to record long-term effects on these vulnerable species. As long as existing control methods continue, no matter the precautions taken, fish populations will be affected. Whether or not this remains a tenable situation is a question for this symposium and the future. (Author abstract by permission)

81-0909. Spangler, G. R.; Collins, J. J. (Dep. Entomol. Fish. & Wildl., Univ. Minnesota, St. Paul, MN 55108) **Response of lake whitefish (*Coregonus clupeaformis*) to the control of sea lamprey (*Petromyzon marinus*) in Lake Huron.** *Can. J. Fish. Aquat. Sci.* 37(11): 2039-2046; 1980 (32 references).

Changes in population parameters of three stocks of whitefish (*Coregonus clupeaformis*) in Lake Huron following control of sea lamprey (*Petromyzon marinus*) have varied between the major basins of the lake. In the North Channel and main basin, whitefish survival rates increased significantly, from values of 23-37% and 16-24%, respectively. In both areas the abundance of lamprey declined while whitefish increased. In Georgian Bay, whitefish populations did not reflect changes attributable to lamprey control, possibly because of low lamprey abundance. During the control period, whitefish survival rates declined from 57 to 39%, abundance declined and growth rates increased. (Author abstract by permission)

81-0910. Sawyer, A. J. (Dep. Entomol., Cornell Univ., Ithaca, NY 14853) **Prospects for integrated pest management of the sea lamprey (*Petromyzon marinus*).** *Can. J. Fish. Aquat. Sci.* 37(11): 2081-2092; 1980 (112 references).

The concepts of integrated pest management (IPM) may be applied to the problem of controlling the sea lamprey, *Petromyzon marinus*, in the Great Lakes. IPM originated as the integration of biological and chemical methods of insect control. It has since evolved into an interdisciplinary approach to ecologically, economically, and socially compatible pest control based on applied systems ecology, real-time monitoring systems and optimal control theory. The component processes of sea lamprey population dynamics are discussed with reference to key ecological variables and possible control points. To implement an integrated approach to sea lamprey pest management successfully, work is needed on basic lamprey biology and ecology, predictive models, alternative control tactics, and the economics of lamprey-induced injury to fish. (Author abstract by permission)

81-0911. Hanson, L. H.; Manion, P. J. (Hammond Bay Biol. Stn., US Fish & Wildl. Serv., Millersburg, MI 49759) **Sterility method of pest control and its potential role in an integrated sea lamprey (*Petromyzon marinus*) control program.** *Can. J. Fish. Aquat. Sci.* 37(11): 2108-2117; 1980 (30 references).

The sterility method of pest control could be an effective tool in the sea lamprey (*Petromyzon marinus*) control program in the Great Lakes. Some of the requirements for its successful application have been met. A field study demonstrated that the release of male sea lampreys, sterilized by the injection of 100 mg/kg of *P,P*-bis(1-aziridinyl)-N-methylphosphinothioic amide (bisazir), will reduce the number of viable larvae produced. The actual reduction in reproductive success that occurred was directly related to the ratio of sterile to normal males in the population. The technique can be used in many ways in an integrated control program and has considerable potential for the more effective control of the sea lamprey. Eradication is a distinct possibility. (Author abstract by permission)

81-0912. Teeter, J. (Monell Chem. Senses Cent., Philadelphia, PA 19104) **Pheromone communication in sea lampreys (*Petromyzon marinus*): implications for population management.** *Can. J. Fish. Aquat. Sci.* 37(11): 2123-2132; 1980 (72 references).

The results of recent preference tests indicate that both male and female landlocked sea lampreys (*Petromyzon marinus*), after reaching a specific stage of sexual maturation, release pheromones which attract conspecifics of the opposites sex. In addition, sexually immature males, captured at the beginning of a spawning migration, exhibit a preference for water in which sea lamprey larvae have been held, suggesting that chemical signals, originating from populations of sea lamprey larvae in a river, may aid migrating adults in selecting as suitable spawning stream. The possible influence of a number of environmental and physiological factors on pheromone communication in sea lampreys is discussed. Synthetic pheromones have been utilized in insect pest management programs as lures for mass-trapping one or both sexes and for disrupting normal pheromone communication. Similar strategies may be applicable in an integrated program of sea lamprey population management. (Author abstract by permission)

81-0913. Pawuk, W. H.; Ruehle, J. L.; Marx, D. H. (South. For. Exp. Stn., Pineville, LA 71360) **Fungicide drenches affect ectomycorrhizal development of container-grown *Pinus palustris* seedlings.** *Can. J. For. Res.* 10(1): 61-64; 1980 (16 references).

Seven fungicides were tested on container-grown longleaf pine (*Pinus palustris* Mill) seedlings inoculated with *Pisolithus tinctorius*. Fungicides were applied to plots at 5 mg AI/seedling in 50 ml water immediately after transplantation and at 4 wk intervals thereafter. Fungicides tested included Benlate (benomyl), captan, Truban, (ethazole; etridiazole), Banrot (ethazole + thiophanate methyl), Dexon (fenaminosulf), Terraclor (quintozene) and Mertect (thiabendazole). Seedlings were fertilized 3 wk after transplanting and every 3 wk thereafter with a water soluble N-P-K fertilizer at 20-20-20. Ectomycorrhizal development by *P. tinctorius* was completely stopped by terrachlor, reduced by captan and Dexon, not affected by Mertect and Truban, and stimulated by Benlate and Banrot. In the noninfested medium, ectomycorrhizal formation by airborne fungi was greater on seedlings drenched with Benlate, Mertect, and Dexon than on the control. Terrachlor and Truban reduced *Thelephora terrestris* ectomycorrhizal development. Fresh top and root wt were not affected by fungicide treatment. Stem diameters of seedlings treated with captan, Dexon, Mertect and Truban were larger in the noninfested medium than in the medium with *P. tinctorius*.

81-0914. Cessna, A. J.; Holt, N. W.; Drew, B. N. (Res. Stn., Agric. Canada, Regina, Saskatchewan S4P 3A2, Canada) **Tolerance and residue studies of triallate in lentils.** *Can. J. Plant. Sci.* 60(4): 1283-1288; 1980 (11 references).

The tolerance of lentils (*Lens culinaris* Medic.) to both preplant and postplant spring incorporation of the wild oat herbicide triallate [*S*-(2,3,3-trichloroallyl) diisopropylthiocarbamate] was studied at two locations. Seed yield, maturity and stand density were not affected by application rates considered adequate for effective wild oat (*Avena fatua* L.) control. An analytical method for determining triallate residues in lentil green tissue and mature grain was developed. Using electron-capture gas chromatographic detection, the limit of detection, based on a 1 g fresh-wt sample, was 20 ppb. Recoveries were in the order of 75% at the 50 ppb fortification level. Triallate residues did not exceed 20 ppb in any of the samples. (Author abstract by permission)

81-0915. Daterman, G.; Sartwell, C.; Sower, L. L. (Pac. Northwest For. Range Exp. Stn., For. Sci. Lab., Corvallis, OR) **Prospects for controlling forest Lepidoptera with controlled release pheromone formulations.** In: *Controlled Release of Bioactive Materials.* Barker, R., ed. (Academic Press: NY): pp. 213-226; 1980 (21 references).

A review is presented of the current status of the use of pheromones to control forest Lepidoptera. The use of pheromones to disrupt mating is concluded to be the strategy with the most potential. Application of large quantities of synthetic sex pheromone blocks the males' ability to detect the low pheromone levels emitted by the females. This method has been very successful with the western pine shoot borer; the low density of this pest (a few hundred/pine plantation) is suggested to be significant in the success of this method. This method has also been suc-

cessful against the gypsy moth, Douglas-fir tussock moth, and spruce budworm. Pheromone application technology is discussed, including development of formulations of controlled-release pheromones and determination of the correct spacing (coverage) of mating-disruption releases. It is suggested that low density forest pests are good candidates for control by mating disruption; high-density forest pests may require supplementary methods. [Presented at the 6th Int. Symp. Controlled Release Soc.]

81-0916. Brooks, T. W.; Doane, C. C.; Osborn, D. G.; Haworth, J. K. (Conrel, Albany Int. Co., Needham Heights, MA) **Experience in using a hollow fiber controlled release formulation in pheromone mediated suppression of *Pectinophora gossypiella* under humid tropical conditions.** In: *Controlled Release of Bioactive Materials.* Baker, R., ed. (Academic Press: NY): pp. 227-236; 1980 (14 references).

Studies were conducted in which a hollow fiber controlled release formulation of pheromone was used to suppress cotton pests under humid tropical conditions. Nomate PSW (gossyplure) was tested on 320 ha of an isolated farm 45 km from Santa Cruz, Bolivia, for the control of *Pectinophora gossypiella.* A 30 ha control field, 4 km from the experimental field, was given conventional pesticide treatment. In the experimental field, a total of five Nomate PBW applications were made by air at a rate of 50 g/ha. Concurrently, pheromone baited traps were deployed on the fields throughout this study. Trapping indicated that fewer male *P. gosspiella* were present in the Nomate PBW fields than in the control field. Larval infestation of cotton was significantly less in the Nomate PBW treated fields than in controls. A cost analysis showed a 67% reduction in insecticide use for the Nomate PBW treatment; the value of yield and fiber value for the pheromone treated fields exceeded area averages by 58%, or $292/ha; the cost of treatment was $182/ha for conventional and $174/ha for phermone. This method is suggested as a considerable economic advantage over conventional methods, due to the increased quality and production. [Presented at the 6th Int. Symp. Controlled Release Soc.]

81-0917. Thomas, J. D.; Cowley, C.; Ofusu-Barko, J. (Sch. Biol. Sci., Univ. Sussex, Falmer, Brighton, England) **Behavioral responses to amino and carboxylic acids by *Biomphalaria glabrata*, one of the snail hosts of *Schistosoma mansoni.*** In: *Controlled Release of Bioactive Materials.* Baker, R., ed. (Academic Press: NY): pp. 433-448; 1980 (28 references).

Studies were performed to investigate the response of snails to amino and carboxylic acids. Large *Biomphalaria glabrata* were acclimated for 2 days prior to testing. Snails were placed in olfactometers which tested the chemoreception of the test chemicals. The position of each snail was observed at intervals of 2.0 to 2.5 min over 16 successive time intervals, replicated 40 times. Snails were scored as to whether they were on the test side or on the control side of the apparatus. Four amino acids attracted snails, but were not consistently effective. Ten amino acids were significantly successful repellents. Simple straight chain aliphatic acids were effective both as attractants and arrestants. The propionate ion was effective at concentrations as low as 5×10^{-7} *M*. The hydroxy acids, glucolic acids, L(+) lactic acid and γ-hydroxybutyric acids were effective attractants or arrestants, but the response indices were lower than those of the corresponding acid in all 3 cases. Dicarboxylic acids were strong attractants when the chains were short, decreasing in effectiveness as the chain length increased. Further work is needed to determine the specificity of action of the controlled release substances which appear to be effective attractants or suppressants. [Presented at the 6th Int. Symp. Controlled Release Soc.]

81-0918. Harrison, H. F., Jr. (Univ. Illinois, Urbana-Champaign, IL) **Studies on the herbicidal properties of SN 533 (epronaz; 1-(*N*-ethyl-*N*- propylcarbamoyl) -3-propylsulphonoyl-1,2,4-triazole) and its uptake, translocation and metabolism by soybeans and peanuts.** *Diss. Abstr. Int. B* 41(6): 2012; 1980.

The purpose of this study was to evaluate SN 533 (epronaz) for pre-emergence and post-emergence herbicidal activity and to determine its fate in soybeans (*Glycine max* L.) and peanuts (*Arachis hypogea* L.). Root applied SN 533 proved to be highly phytotoxic to plants growing in nutrient solution culture. Peanut was most resistant of the species tested. Approximately 13% of ^{14}C-label from foliar applied ^{14}C-SN 533 was translocated out of the treated leaf of soybeans, and about 2% of the ^{14}C-label was translocated out of the treated leaf of peanuts. Meristem accumulation of ^{14}C-label was much higher in soybeans than in peanuts after 1 day, but the specific activity of soybean meristems declined after 4 and 8 days. Root applied ^{14}C-SN 533 was readily absorbed by both species. Root absorbed ^{14}C-SN 533 was rapidly metabolized by soybeans and peanuts. After 8 days, less than 2% of the total extractable radioactivity was identified as unaltered SN 533 by TLC. The level of unaltered SN 533 after 1 day was higher in soybeans than in peanuts. The disappearance of ^{14}C-SN 533 coincided with the appearance of unknown polar metabolites in both species. The major components of the unknown polar ^{14}C-metabolites extracted from soybean and peanut leaflets appeared to be different. The release of PST (3-propylsulphonyl- 1,2,4-triazole) by alkaline hydrolysis of the unknowns suggested that they were bound or conjugated forms of SN 533 or PST. Residues of ^{14}C-SN 533 were present in all analyzed sections of soybean and peanut plants that were planted in treated soil and harvested at flowering and at maturity. Generally, ^{14}C-label concentrations and total ^{14}C absorption was higher in soybeans than peanuts. The results of this study suggest that SN 533 is rapidly metabolized to polar con-

jugates in soybeans and peanuts. Differential translocation and metabolism of the herbicide by soybeans and peanuts may be involved in the observed differences in its phytotoxicity to the two species. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 8026513.)

81-0919. Cutter, S. C. (Author address not given) **Community concern for pollution. Social and environmental influences.** *Environ. Behav.* 13(1): 105-124; 1981 (30 references).

Community attitudes toward pollution, which vary among social groups and with levels of pollution, are examined. It was hypothesized that in communities with high pollution levels higher levels of concern will be exhibited than in those communities with low pollution levels. High status white communities were expected to show more concern about pollution than lower status Black communities. Twenty-three environmental variables (including pesticide poisoning) and 19 social variables were found to be significant factors in community concern about pollution. Twenty-two Chicago community areas were selected to exemplify the 8 environmental pollution-social differentiation types. The hypothesis that race and economic status would be the most important social predictors of community concern over pollution was not supported by the findings of this study. The areas of Chicago with high percentages of non-white ethnic populations were the most concerned about pollution levels. Community concern did appear to be related to housing quality and neighborhood instability, with high mobility rates and population densities being important factors. The hypothesis that areas with high pollution levels would be significantly concerned about these levels was supported by the study. The hypothesis that pollution level indicators would be more important in the prediction of community concern than social indicators was not supported by the data.

81-0920. Porteous, J. W. (Dep. Biochem., Univ. Aberdeen, Aberdeen AB9 1AS, Scotland) **Intestinal metabolism.** *Environ. Health Perspect.* 33: 25-35; 1979 (59 references).

In many cases the intestine is the first organ to be injured following ingestion of foreign substances. This paper reviews the general anatomical structure of the intestine and explains the functions of the luminal surface, the immediate subepithelial component of mucosal tissue, and the circular and longitudinal muscle layers. The relationship of morphology, kinetics of cell proliferation, migration, differentiation and distribution of cell types and cell components to the choice of an experimental system to be used to monitor the effects of various chemicals, including pesticides and herbicides, are considered. Detailed information is given concerning the metabolism of glucose, amino acids, and ketone bodies by various sections of the intestine. It was concluded that the three preparations of intestine described should provide excellent tools for screening the effects of exogenous chemicals on the intestine.

81-0921. Huff, J. E.; Moore, J. A.; Saracci, R.; Tomatis, L. (Natl. Toxicol. Program, Research Triangle Park, NC 27709) **Long-term hazards of polychlorinated dibenzodioxins and polychlorinated dibenzofurans.** *Environ. Health Perspect.* 36: 221-240; 1980 (135 references).

A report on the long-term hazards of polychlorinated dibenzodioxins and polychlorinated dibenzofurans, present in some pesticide formulations as toxic impurities, was compiled from a symposium held in 1978. Several aspects of the toxicity of these compounds are discussed. Animals that receive toxic or lethal doses exhibit chronic weight loss, mobilization of peripheral fat, increased serum triglyceride levels, and development of fatty livers. As little as 1-10 μg/kg cause increased frequencies of cleft palate and kidney abnormalities in mice. Many other effects on animals are discussed, including enzyme induction abnormalities, bone marrow hypoplasia, testicular degeneration, and hemorrhage. Toxic effects in humans include a wide range of clinical signs and symptoms. Early signs are burning eyes, nose and throat, headache, vomiting and nausea. Within a month acneform eruptions emerge and the skin becomes hyperpigmented. Neuromuscular symptoms, porphyria cutanea tarda, hepatic dysfunction, and hyperlipidema might also occur. Cause studies of human exposure are described.

81-0922. McGrath, S. P.; Baker, A. J. M.; Morgan, A. N.; Salmon, W. J.; Williams, M. (Dep. Bot., Univ. Sheffield, Sheffield, South Yorkshire S10 2TN, England) **The effects of interactions between cadmium and aluminum on the growth of two metal-tolerant races of *Holcus lanatus* L.** *Environ. Pollut.* 23(4): 267-277; 1980 (40 references).

A solution culture technique was used to determine the effects of cadmium and aluminum on Cd-tolerant and Al-tolerant races of the grass *Holcus lanatus*. It is pointed out that Cd enrichment may result, among other sources, from agricultural practices and from fungicidal spraying. Experimental plants were separated into separate tillers prior to exposure to Cd and Al, alone or in combination. At 7, 14 and 17 days of exposure, the length of the longest root in each tiller was measured, and at 17 days the tillers were harvested and dry weight of roots and shoots recorded. The dry matter was ashed, digested, and analyzed for Al and Cd by atomic absorption spectrophotometry. All treatments brought about significant depression of root growth in both population types. Differential susceptibility of populations of *Holcus lanatus* to Cd and Al was observed. For example, addition of Al to Cd treatments stimulated root growth of the Loxley population, but addition of Al suppressed root growth in the Haller population,

particularly in the presence of Cd. These interactive effects are discussed with regard to possible metal antagonisms experienced under field conditions.

81-0923. Afghan, B. K., ed.; MacKay, D., ed. (Natl. Water Res. Inst., Burlington, Ontario, Canada) ***Hydrocarbons and Halogenated Hydrocarbons in the Aquatic Environment.*** *Environ. Sci. Res.* 16: 588 pp.; 1980.

Papers selected from those presented at the International Symposium on the Analysis of Hydrocarbons and Halogenated Hydrocarbons in the Aquatic Environment held in May of 1978 are presented. The purpose of the symposium was to collect information on the analysis, behavior and effects of hydrocarbons and halogenated hydrocarbons on the aquatic environment. Topics included: quantitative analytical results; analytical methods; incidence, monitoring and pathways; and drinking water, health and biological effects. In the keynote address several examples are given which demonstrate why environmental agencies must place a high priority on development, standardization and use of microanalytical methods for hydrocarbons and halogenated hydrocarbons. Abstracts of papers from this symposium can be found in the appropriate sections of this issue of *Pesticides Abstracts.*

81-0924. Hutzinger, O.; Roof, A. A. M. (Lab. Environ. & Toxicol. Chem., Univ. Amsterdam, NL-1018 WV Amsterdam, The Netherlands) **Hydrocarbons and halogenated hydrocarbons in the aquatic environment: some thoughts on the philosophy and practice of environmental analytical chemistry.** *Environ. Sci. Res.* 16: 9-28; 1980 (35 references).

The tasks of environmental analysis are outlined. The limited resources and manpower available for analysis of environmental contaminants make it essential that duplication of effort be avoided and unnecessary determinations not be made. In order to determine when a particular chemical may present a hazard to the environment, a study of the nature of the chemical; factors which contribute to its possible release in the environment; route of entry into the environment; physical distribution processes in the environment; and chemical processes responsible for the transformation of a chemical into a hazardous substance must all be investigated.

81-0925. Keith, L. H. (Radian Corp., Austin, TX 78766) **Organic pollutants in water: identification and analysis.** *Environ. Sci. Technol.* 15(2): 156-162; 1981.

Advances in detection, sampling and determination techniques for organic chemical analysis are reviewed. These advances were presented at the environmental chemistry portion of the Chemical Congress of the North American Continent. Several papers discussed the analysis and distribution of PCBs in the environment. Distribution of PCBs was studied in both surface waters and subsurface waters. Use of the atmospheric pressure-chemical ionization-mass spectrometric analysis of over 1000 soil samples was described, along with negative ion chemical ionization high-resolution gas chromatography/mass spectrometry for the analysis of PCBs. Methods for sample concentration were updated, including microextraction techniques and resin technology. Advances in HPLC methodology, sludge methodology and purge and trap methods were also noted.

81-0926. Timofeev, M. M.; Sosnovaya, O. N.; Merezhinsky, Yu. G. (Inst. Plant Physiology, Kiev, USSR) **Intensivnost' i chistaia produktivnost' fotosinteza kartofelia v sviazi s primeneniem gerbitsidov i usloviiami pitaniya. [Intensity and pure productivity of potato photosynthesis relative to application of herbicides and nutrition conditions.]** *Fiziol. Biokhim. Kul't. Rast.* 12(2): 158-164; 1980 (26 references) (Russian).

The effect of herbicides prometryne and linuron on the intensity and output of the photosynthesis was studied in potato. Both herbicides were found to inhibit the photosynthetic processes during the first half of the vegetative period. During the second half of the vegetative period there was an increase of the photosynthesis output. The effect of herbicides depended upon the fertilizer level.

81-0927. Sittig, M., ed. (Author address not given) ***Hazardous and Toxic Effects of Industrial Chemicals.*** (Noyes Data Corp.: NJ): 460 pp.; 1979.

This book reviews the hazardous and toxic effects of various chemicals used in the industrial community. Data contained in the text is based on publications issued by various governmental agencies. Information is presented on about 250 individual compounds. Included are a description, synonyms, potential occupational exposures, permissible exposure limits, routes of entry, harmful effects both systemic and local, medical surveillance required, special tests if any, personal protection measures to be taken and a bibliography. Abstracts of monographs from this book will appear in appropriate sections of this issue of *Pesticides Abstracts.*

81-0928. Stewart, J. K.; Aharoni, Y.; Hartsell, P. L.; Young, D. K. (Market Qual. & Transport. Res Lab., Agric. Res., SEA, USDA, Fresno, CA 93747) **Symptoms of acetaldehyde injury on head lettuce.** *HortScience* 15(2): 148-149; 1980 (3 references).

Phytotoxicity of acetaldehyde at excessive concentrations to lettuce is reported. Freshly harvested heads of Calmar and Salinas lettuce were experimentally infested

with aphids and then placed in air-tight jars. Precooled liquid acetaldehyde, gaseous concentrations of 1, 1.5, 2, 3, 4, 5, or 6% by volume, was then injected for 4 hr at 21°C. Aphid mortality was determined at 2 days and phytotoxicity to lettuce was evaluated after 2 wk. Fumigation for 4 hr with 1.5 or 2% acetaldehyde killed all aphids and did not injure the lettuce. Higher concentrations injured the lettuce as evidenced by large dark-green, sometimes water-soaked, areas on the leaves and by severe wilting. Another type of injury was characterized by numerous small, tan to brown lesions appearing primarily on or near the base or curvature of the midrib leaves.

81-0929. Ferreira, G. A.; Seiber, J. N.* (Dep. Environ. Toxicol., Univ. California, Davis, CA 95616) **Volatilization and exudation losses of three *N*-methylcarbamate insecticides applied systemically to rice.** *J. Agric. Food Chem.* 29(1): 93-99; 1981 (25 references).

Rice seedlings were treated by a root-soak systemic method or by foliage spray with carbofuran, carbaryl, or aldicarb. Distribution of residues was followed for 10 days in a small glass chamber provided with air flow and illumination for 12 hr each day. The plant culture medium, plant parts, outflow vapor trap, and chamber walls were analyzed for parent carbamate. For carbofuran, physical loss of systemically absorbed residue occurred by root exudation (1775 μg or 35.6% of the initial residue in plant tissue) and volatilization (290 μg or 5.8% of the initial residue in plant tissue). Comparable data for carbaryl and aldicarb were 1928 μg (22%) and 2280 μg (14%), respectively, for root exudation and 367 μg (4.2%) and 920 μg (5.6%), respectively, for volatilization. A rapid translocation of all 3 insecticides to leaves occurred after treatment; residues moved through the leaf tip to the outside leaf surface by guttation and were available for volatilization. The relative importance of steps contributing to volatilization was related to insecticide stability, water solubility, and vapor pressure. (Author abstract reprinted by permission of the American Chemical Society)

81-0930. Bull, D. L.; Ivie, G. W. (Cotton Insects Lab., Agric. Res., SEA, USDA, TX 77841) **Fate of *O*-{4-(4-chlorophenyl)thio)phenyl} *O*-ethyl *S*-propyl phosphorothioate (RH-0994) in cotton.** *J. Agric. Food Chem.* 29(1): 121-125; 1981 (5 references).

After a single topical application to individual cotton leaves of field-grown cotton, residues of [^{14}C]RH-0994 {*O*-[4-[(4-chlorophenyl) thio]phenyl] *O*-ethyl *S*-propyl phosphorothioate} and its intact ester derivatives, either on the leaf surface or within the leaf, were essentially depleted at 14-days posttreatment. Studies of the distribution of radioactive residues in cotton plants after 10 spray applications of [^{14}C]RH-0994 (1.12 kg/ha/application) at 5-day intervals indicated that appreciable levels of radioactive material, including the parent compound and its intact ester derivatives, accumulated on foliage that was present during sprays. Mature cottonseed and lint from bolls that opened after treatments had been stopped also contained approximately 2 ppm of [^{14}C]RH-0994 equivalents; however, results of solvent extraction studies suggested that these residues did not include RH-0994 or its intact ester derivatives. Radioactive products of [^{14}C]RH-0994 identified in plants included the sulfoxide and sulfone derivatives of the intact ester, produced by oxidation of the thioether sulfur, and three substituted phenols, which were produced by hydrolysis of the respective esters and were present in both free and conjugated forms. (Author abstract reprinted by permission of the American Chemical Society)

81-0931. Reggiani, G. (F. Hoffmann La Roche Ltd., Basel, Switzerland) **Acute human exposure to TCDD in Seveso, Italy.** *J. Toxicol. Environ. Health* 6(1): 27-43; 1980 (13 references).

Findings resulting from the examination of individuals exposed to TCDD through the explosion in Seveso, Italy, are reported. Twenty-two people were used as the data source. Examinations were conducted for toxic dermatitis caused by the caustic chemicals and for possible potential systemic poisoning from TCDD. Almost all 22 patients were in the area closest to the reactor at the time of the accident, Zone A. Dermal symptoms were basically of two types, diffuse redness and swelling of the skin or eruption of blackhead cysts of different sizes. In all but 2 cases the severity of the chloracne was mild, lasting from 8 to 26 mo. The only other symptoms noted were gastrointestinal tract disturbances of short duration during the first few days after onset of skin lesions, and some burning of the eyes. Temperatures were always normal. There was no evidence of neurological problems, immunodeficiencies, abnormal chromosomes, cardiovascular system abnormalities, or abnormalities in standard laboratory tests. No lasting complications were found.

81-0932. Mel'nikov, N. N. (All-Union Res. Inst. Chem. Means Plant Prot., Leningrad, USSR) **Pestitsidy i okruzhaiushchaya sreda (analiticheskii obzor). [Pesticides and environment (literature review).]** *Khim. Sel'sk. Khoz.* 18(10): 36-39; 1980 (38 references) (Russian).

Literature pertaining to the environmental impact of pesticides is reviewed. At present pesticides containing such toxic elements as arsenic, mercury, lead and selenium are banned. The only exception is mercury-containing compounds used as fungicides (rate of application 1-3 g/ha). Pesticides are divided into 6 groups depending upon the rate of degradation. It is emphasized that the rate of degradation depends not only on the physico-chemical properties of the given pesticide, but also on the soil-climatic conditions. Organochlorine compounds are the most

stable. Organophosphorus compounds, derivatives of methylcarbamic acid, and urea herbicides undergo rapid degradation in the aqueous medium. Organochlorine pesticides, except lindane and methoxychlor, are persistent in fish. The toxicity of the herbicide 2,4,5-T and its contaminant tetrachlorodibenzodioxin are discussed.

81-0933. Ivanova, G. B. (All-Union Res. Inst. Chem. Means Plant Prot., Leningrad, USSR) **O rezistentnosti nasekomykh k diftorbenzuronu. [Resistance of insects to diflubenzuron.]** *Khim. Sel'sk. Khoz.* 18(11): 18-19; 1980 (17 references) (Russian).

Toxicity of the juvenile hormone analog diflubenzuron (1-(2-6-difluorobenzoyl)-3(4-chlorophenyl)-urea) to house fly larvae resistant to various insecticides was studied. Diflubenzuron at 0.00005-.01% concentrations resulted in the death of 31-87% of larvae of the sensitive strain. Strains resistant to phthalophos (phosmet), Koral (coumaphos), chlorophos (trichlorfon), malathion, neopinamine, and Gardonna (tetrachlorvinphos) were also resistant to diflubenzuron at 0.015-1% concentrations.

81-0934. Melekhov, E. I.; Smirnova, G. M. (All-Union Res. Inst. Chem. For., USSR) **Spetsificheskoe i nespetsificheskoe deistvie 2,4-D na kletku i tseloe rastenie. [Specific and nonspecific effect of 2,4-D on the cell and entire plant.]** *Khim. Sel'sk. Khoz.* 18(11): 26-27; 1980 (17 references) (Russian).

Specific and nonspecific effects of the herbicide 2,4-D were studied in bean plants. The roots of 16-day plants were immersed in 2,4-D solution (10^{-2} *M*). The death of plants was recorded on day 8-10 after the treatment. Microscopic examination of leaves showed retention of protoplasm movement, which indicated the absence of cytophysiological effect, in spite of the pronounced injury of the entire plant. Leaves were immersed in a 10^{-2} *M* 2,4-D solution. Chlorophyll degradation and death of cells due to direct contact with the herbicide were found. Wheat coleoptiles (3-days-old) were treated with 2,4-D at $2\text{-}3 \times 10^{-4}$ *M*. Dose dependent inhibition of coleoptile growth was observed.

81-0935. Bower, C.; Stanley, F. J. (Congenital Malformations Regist., N.H. and M.R.C. Res. Unit Epidemiol. & Prev. Med., Queen Elizabeth II Med. Cent., Nedlands, Western Australia, Australia) **Herbicides and cleft lip and palate.** *Lancet* 2(8206): 1247; 1980 (2 references).

A letter to the editor is presented which disputes a previously published letter regarding the role of herbicides in the incidence of cleft lip and palate. The previous letter implied that in Western Australia there was a link between herbicide usage and the conception and birth of children with cleft lip and/or palate. It is pointed out that the study had no controls, was based on very small numbers (approximately 30 cases annually), and included only those children with cleft lip and/or palate who survived beyond 28 days. In addition, no data on herbicides or usage were presented. In Western Australia the incidence of cleft lip and/or palate is decreasing while herbicide use is increasing. It is suggested that the conclusions in the previous letter may be based on poor documentation.

81-0936. Mulcahy, M. T. (Cytogenet. Unit, Queen Elizabeth II Med. Cent., Nedlands, Western Australia 6009, Australia) **Chromosome aberrations and Agent Orange.** *Med. J. Aust.* 2(10): 573-574; 1980 (2 references).

This letter-to-the-editor reports findings on 15 Vietnam War veterans tested for chromosomal damage. All subjects claimed to have been exposed to Agent Orange (2,4-D + 2,4,5-T). All subjects reportedly suffered a variety of symptoms associated with Agent Orange poisoning. Eight control subjects, matched for age and sex, were selected from couples presenting for amniocentesis solely for advanced maternal age. Incidences of chromosomal aberrations and sister chromatid exchanges in patients and control subjects were determined by examination of lymphocyte cultures grown in parallel. No significant difference was noted between subjects and control group. The authors suggest that the 10-yr period between exposure and testing was too long for cytogenic tests to yield positive evidence of chromosome damage.

81-0937. Lamoureux, G. L.; Rusness, D. G. (Metab. & Radiat. Res. Lab., Agric. Res., SEA, USDA, Fargo, ND 58105) ***In vitro* metabolism of pentachloronitrobenzene to pentachloromethylthiobenzene by onion: characterization of glutathione *S*-transferase, cysteine C-S lyase, and *S*-adenosylmethionine methyl transferase activities.** *Pestic. Biochem. Physiol.* 14(1): 50-61; 1980 (33 references).

The metabolism of PCNB (quintozene) in onions is analyzed and the activities of participating enzymes were characterized. Onions (*Allium cepa*) were grown from seed to 9-15 wk of age, the roots were excised, ground, and the protein fractions isolated. Enzymes thus obtained were assayed under a variety of conditions. The assays indicated that the reaction sequence for the metabolism of PCNB was as follows: PCNB → *s*-(pentachloropheny!)glutathione → *s*-(pentachlorophenyl)-γ-glutamylcysteine → *s*-(pentachlorophenyl) cysteine → PCTP → PCTA. It appears that this enzyme system could be used to characterize other glutathione conjugates.

81-0938. Oettmeier, W.; Masson, K. (Lehrstuhl Biochem. Pflanzen, Ruhr Univ., D-4630 Bochum, BRD) **Synthesis and thylakoid membrane binding of the radioactively labeled herbicide dinoseb.** *Pestic. Biochem. Physiol.* 14(1): 86-97; 1980 (40 references).

The synthesis of i-dinoseb, an isomer of the phenolic herbicide dinoseb, and its binding to broken chloroplasts isolated from spinach are described. A methanolic solution of [^{3}H]i-dinoseb was added to chloroplast suspension, incubated for 5 min and the radioactivity bound to the chloroplasts and the medium was assayed by two different liquid scintillation counting methods. The binding constant ($K_a = 6.9 \times 10^8$ *M*) was determined for i-dinoseb and its binding to chloroplasts was found to be pH dependent and biphasic. Displacement behavior was estimated from radioactivity after a 5 min incubation. DCMU (diuron)-type inhibitors and inhibitory uncouplers were found to displace i-dinoseb from the thylakoid membrane, but DMBIB-type inhibitors did not. The DCMU-type herbicides interfere non-competitively with the specific binding of i-dinoseb, but phenolic herbicides interfere competitively. It is concluded that the binding sites of both types of herbicides are located on the same protein but are not identical.

81-0939. Driver, E. A.; Derksen, A. J. (Prarie Migratory Bird Res. Cent., Canadian Wildl. Res. Serv., Saskatoon, Saskatchewan S7N OX4, Canada) **Mercury levels in waterfowl from Manitoba, Canada, 1971-72.** *Pestic. Monit. J.* 14(3): 95-101; 1980 (36 references).

From 2 locations in Manitoba suspected of mercury pollution, waterfowl were collected during 1971 and 1972 to determine the incidence and nature of the contamination. Total mercury concentrations averaged 0.18 ppm and 0.22 ppm in breast muscle of 169 adult dabbling *(Anatini)* and 77 adult diving ducks *(Aythyini, Mergini,* and *Oxyurini),* respectively. Mercury concentrations in breast muscles of immature ducks of these tribes averaged 0.15 ppm total mercury for 70 dabblers and 0.16 ppm for 40 divers. Mean mercury residues in livers were 0.54 ppm and 0.31 ppm, respectively, in 60 adults and 30 immature dabblers and 0.93 ppm and 0.29 ppm, respectively, in 31 adults and 15 immature divers. Primary feathers of 20 adult and 12 immature dabblers collected in the Saskatchewan River Delta averaged 2.67 ppm and 1.34 ppm, while 10 adult and 7 immature divers averaged 1.48 ppm and 1.11 ppm, respectively. Only in 20 ducks, 10 dabblers and 10 divers, did mercury concentrations in the breast muscle exceed 0.50 ppm. Statistically significant relationships for the concentration of mercury in feathers to breast muscle, feathers to liver, and breast muscle to liver were found for spring adults and for immature dabbling ducks. The only significant relationship for divers was feather to liver concentrations of spring adults in 1972 in the Saskatchewan River Delta. (Author abstract by permission)

81-0940. Shrivastava, S. K.; Philip, R. (Dep. Entomol. & Pathol., M. P. Rice Inst., Raipur, India) **Effect of mephospholan on the germination of rice seeds.** *Pesticides* 14(9): 37; 1980 (2 references).

The effects of mephosfolan on rice seed germination were studied on seeds treated at concentrations of 250, 500, 750, and 1000 ppm. Mephosfolan did not cause any adverse effects on the germination up to 750 ppm. At 1000 ppm germination was reduced by 35%. Shoot length was greatly reduced at 1000 ppm. The ratio of root to shoot length also steadily increased with increased concentrations of mephosfolan.

81-0941. Upadhyaya, M. K.; Nooden, L. D. (Bot. Dep., Univ. Michigan, Ann Arbor, MI 48109) **Mode of dinitroaniline herbicide action II. Characterization of ^{14}C-oryzalin uptake and binding.** *Plant Physiol.* 66(16): 1048-1052; 1980 (12 references).

Corn root apices were treated with [^{14}C]oryzalin to analyze the mode of action of dinitroaniline herbicides (DNAs). [^{14}C]Oryzalin uptake was determined by periodic sampling of the ambient solution or by direct analysis of root extracts. In metabolism experiments, roots incubated in buffer containing [^{14}C]oryzalin were ground, extracted with acetone, then chromatographed. In other studies, binding of soluble and insoluble fractions was determined. [^{14}C]Oryzalin uptake was found to be rapid; a plateau was reached in about 4 hr. Concentrations in the roots were about 35 times higher than those of the incubation media. Since there was no metabolism of [^{14}C]oryzalin under these conditions and since accumulation was not affected by the respiratory inhibitor sodium azide, it was concluded that [^{14}C]oryzalin is bound to some intracellular site by a process not requiring metabolic energy. [^{14}C]Oryzalin could not be demonstrated to bind to the ribosomal fraction of corn root or rat brain extracts, both sources of microtubule subunit protein. However, there was massive binding to the insoluble fraction of corn root extracts. This high capacity binding was found to be a loose (low affinity) association with the binding sites, and was not localized. Oryzalin may bind to the lipid component of cellular membranes.

81-0942. Nygren, R. G. (Author address not given) **Agricultural pesticides: a lurking public and occupational health hazard and a growing concern for safety and health professionals.** *Prof. Saf.* 26(1): 9-12; 1981 (5 references).

Effects of pesticides on the general public and on occupationally exposed workers are discussed. The history of pesticide use is reviewed. Early insecticides included various inorganic compounds which contained antimony, arsenic, fluorine, lead, mercury, selenium, sulfur and thallium as active ingredients. The discovery of DDT and other organochlorine insecticides greatly increased pesticide use. Some of the common pesticides are listed by classification (insecticide, herbicide, rodenticide, molluscicide, fungicide and nematocide) and pesticide usage is discussed. It is noted that, in addition to environmental contamination, other pesticide effects include mortality of natural predators, and development of genetic

resistance to pesticides. Some of the problems associated with occupational exposure are also discussed.

81-0943. Malizia, E.; Andreucci, G.; Chiavarelli, M.; Amato, A.; Gagliardi, L. (Poison Control Cent., Rome Univ., Rome, Italy) **A follow-up of 20 months of Seveso, an environmental calamity.** *Vet. Hum. Toxicol.* 21(SPPL): 136-140; 1979 (12 references).

Human exposure to TCDD as a contaminant of the herbicide 2,4,5-T, and as a result of various chemical factory accidents, is discussed. Medical follow-up studies have been conducted on persons exposed to TCDD from the Seveso explosion in 1976. The studies were conducted on people living in the contaminated area plus those living in the 11 nearby districts; a total of 216,000 inhabitants. Dermatologic lesions were noted; these have had a generally favorable recovery. Some neurological damage was noted among persons living closest to the factory; of 446 people examined 6.7% demonstrated clinical damage and 3.1% demonstrated subclinical damage. An increased serum enzymatic activity was noted in some subjects but the altered values normalized after a period of time. Post natal development of the approximately 2600 children born after the accident in Seveso has been normal. No mutagenic, teratogenic or embryotoxic damage has been documented. No significant changes in cytogenesis or immunology was found, nor was there an increase in the spontaneous abortion rate. [Presented at the joint annu. mtg. of the Eur. Poison Control Cent. and Int. Assoc. Forens. Toxicol.]

81-0944. Bartlett, P. D.; Craig, P. J.* (Sch. Chem., Leicester Polytech., Leicester, England) **Total mercury and methyl mercury levels in British estuarine sediments. II.** *Water Res.* 15(1): 37-47; 1981 (22 references).

Some results obtained during a 1978 large-scale survey of the sediments of Mersey Estuary, England, are presented. Total mercury in 47 sediment samples was determined by cold-vapor atomic absorption, methyl mercury by electron-capture gas chromatography, sulfide analysis by an iodine titration method, and redox potentials were measured with various platinum-calomel electrode systems. The following correlations were investigated: total mercury to methyl mercury; methyl mercury to organic carbon; total mercury to organic carbon; total mercury to silt; and methyl mercury to silt. The correlation coefficients ranged from 0.55 to 0.94. The results indicate that both total and methyl mercury are associated with the silt fraction or the organic rich sediments, or both. Other tests showed effects of the prevailing redox potentials on the methyl mercury properties in sediment. In addition, results show that sulfide concentrations may also influence methyl mercury levels.

81-0945. Jorgensen, S. E. (Dep. Chem., Royal Danish Sch. Pharm., DK-2100 Copenhagen, Denmark) **Water quality and environmental impact model of the Upper Nile Basin.** *Water Supply & Manage.* 4(3): 147-153; 1980 (6 references).

The HYDROMET project, an international survey effort on the Nile River Basin, has been given approval for expansion into a water quality model to generate data on lakes, eutrophication, aquatic life, irrigation, industrial wastes and environmental impact of various water pollutants. Comprehensive biological data are collected through ten submodels and stored in a data information bank. Areas of focus of these small models include algal growth; zooplankton; fisheries; nutrient exchange between sediment and water; mass balances of P, N, Si, O, and C; a snail; DDT; Cu; and the water and salt balance. The DDT submodel is designed to give information on DDT in suspended solids, water, sediment and various trophic levels of the aquatic food chain, and its passage from each of these phases into another. Flow charts are given for each of the submodels to aid in the understanding and calibration of the main model. The overall water quality model is proposed for use in the planning of environmental policy and in the decision making processes in water quality management.

81-0946. Kanagawa, T.; Dazai, M.; Takahara, Y. (Ferment. Res. Inst., Agency Ind. Sci. & Technol., Yatabe, Ibaraki 305, Japan) **Degradation of *O,O*-dimethyl phosphorodithioate by activated sludge.** *Agric. Biol. Chem.* 44(11): 2631-2635; 1980 (13 references).

O,O-dimethyl phosphorothioate (DMDTP) is the raw material for such organophosphorus pesticides as malathion, dimethoate and cidial (phenthoate), and is abundant in wastewater of pesticide manufacturers. The activated sludge was acclimated to DMDTP by the fill-and-draw method. The acclimated, activated sludge degraded 500 mg/l of DMDTP in 7 hr and as a result, produced 260 mg/l of inorganic orthophosphate and 510 mg/l of sulfate. The pH of the mixed liquor was adjusted to degrade DMDTP, and the optimum pH was from 6.5 to 7.0. The activated sludge acclimated to DMDTP degraded dimethyl phosphorothioate, dimethyl phosphate, diethyl phosphorodithioate and diethyl phosphate. (Author abstract by permission)

81-0947. Laska, P. (Res. & Improv. Inst. Veg., Olomouc, Czechoslovakia) **Rezidua Phosdrinu 24EC v zelenine a ovoci. [Phosdrin 24 EC residues in vegetables and fruit.]** *Agrochemia* 20(11): 326-328; 1980 (22 references) (Czech).

Results of experiments on the effects of temperature and Phosdrin 24 EC (mevinphos) crop residues on various vegetables and fruits are discussed to determine if the mandatory 7 day protection period between treatment and harvesting is adequate. Generally, residues are dependent upon initial dose, type of crop, time elapsed between treatment and harvest, and temperature during that period. Temperature influences were found to be considerable. In paprikas treated with 5 times the recommended dose and stored variously in a warm greenhouse (25°C), a storehouse (12°C), and in open air (8°C) Phosdrin half-lives were 1.8, 8.2 and 11.6 days, respectively. Application rates of 1.2 l/ha at extremely low temperatures resulted in residues 4-fold higher (0.4 mg/kg) than the current allowable limit after 2 wk. Phosdrin residues in grapes and strawberries have also been reported to disappear slowly. These results indicate that the 7 day protection period should be altered to allow for crop and temperature differences.

81-0948. Engst, R. (Cent. Inst. Nutr., Acad. Sci. DDR, Potsdam-Rehbrucke, DDR) **Degradation of pesticides, its importance to the formation of residues, and their evaluation.** *Bibl. Nutr. Dieta* 29: 11-19; 1980 (19 references).

Pesticide degradation, residue formation and residue analyses are discussed. The basic reactions responsible for toxification and detoxification of pesticides include oxidation and reduction, isomerization, alkylation, hydrolysis and elimination reactions. The breakdown of DDT and its accumulation in the food chain are discussed, and examples of residues found in humans and wildlife are given. Lindane, *N*-nitroso compounds and phenols are also discussed. All pesticide residues have been found to be subject to chemical changes in the environment. It is recommended that residue tolerances be based on ecological and toxicological factors, optimal pest control and good agricultural practices.

81-0949. Alnaji, L. K.; Kodoum, A. M.* (Dep. Entomol., Kansas Agric. Stn., Kansas State Univ., Manhattan, KS 66506) **Note on the effects of baking on methyl phoxim and malathion residues in bread.** *Cereal Chem.* 58(1): 74-75; 1981 (9 references).

Clean, uninfested, hard red winter wheat was aerated at about 39°C to reduce moisture from 13.5 to 12.5% and was then stored in covered cardboard drums for 2 wk for moisture equilibration. Premium grade 57% malathion EC (0.6 kg/l) and 25% methyl phoxim EC (0.25 kg/l) were applied as water emulsions to the wheat at 10 ppm via a commercial nozzle. Insecticides were applied as the grain turned in a 55-gal drum on a drum roller machine. After grain was mixed an additional 15-20 min, the wheat was placed in a 35 gal uncovered fiber drum and stored at 26°C, 60% rh. Samples were taken at 1, 7, 14, 21, 30, 60, 90, 180, 270, and 365 days of storage for milling into straight grade flour after being tempered. The mean recovery of residues decreased with increased time in both whole wheat and bread made from the grain. Methyl phoxim penetrated kernels by day 7. Malathion penetrated the kernel by day 14. The insecticides did not affect physical properties of dough in any way. Methyl phoxim and malathion residues in bread from wheat, stored 1 day, were 0.30 ppm and 0.39 ppm, respectively. All bread samples from wheat stored more than 270 days were free of either pesticide.

81-0950. Sattar, M. A.; Paasivirta, J. (Dep. Chem., Univ. Jyvaskyla, SF-40100 Jyvaskyla 10, Finland) **Fate of chlorophenoxyacetic acids in acid soil.** *Chemosphere* 9(12): 745-752; 1980 (37 references).

The persistence of MCPA, 2,4-D and 2,4,5-T in an acid soil with field moist and flooded conditions was investigated. Soil was treated with 10 and 1000 ppm concentrations of the chemicals and incubated for 96 wk at room temperature. MCPA, 2,4-D and 2,4,5-T degraded gradually with incubation, but decomposed mostly within 24 hr. Degradation took longer with the higher levels of herbicides. Degradation was fastest with MCPA; 2,4-D had a similar degradation rate. Soil moisture had a strong influence on the degradation rate of phenoxy acid herbicides in soil. The persistence of MCPA, 2,4-D and 2,4,5-T was longer in flooded conditions than in field moist soil. Under flooded conditions degradation was very slow due to proper microbial decay on the chemicals. The slow degrada-

tion rate suggested that obligate aerobic microorganisms were responsible for the rapid degradation of herbicides occurring in aerobic soil.

81-0951. Seymour, K. G. (Agric. Prod. Dep., Dow Chem. Co., Midland, MI) **Chlorpyrifos release from mosquito larvicide formulations.** In: *Controlled Release of Bioactive Materials.* Baker, R., ed., (Academic Press: NY): pp. 331-342; 1980 (22 references).

Studies were performed to determine the release rates of chlorpyrifos from mosquito larvicides. Rate constants from previous experiments ranged from 0.02 for buffered distilled water (pH 6.9) to 0.47 for tap water (pH 7.7). Canal water (pH 8) and pond water rates were 0.45 and 0.46, respectively. Release rates were determined from Dursban 10CR (chlorpyrifos) and from experimental, noncylindrical particles. The rate was greater from the former, but extended storage reduced its release rate. The hydrolysis of chlorpyrifos in water is described. Hydrolysis rates are accelerated in natural waters; therefore, the levels of chlorpyrifos in natural waters will be lower than the levels in distilled water in these experiments.

81-0952. Cardarelli, N. F.; Evans, W. (Environ. Manage. Lab., Univ. Akron, Akron, OH) **Chemodynamics and environmental toxicity of controlled release organotin molluscicides.** In: *Controlled Release of Bioactive Materials.* Baker, R., ed. (Academic Press: NY): pp. 357-385; 1980 (68 references).

The chemodynamics and toxicological information regarding controlled releas of the molluscicides TBTO [bis(tributyltin)oxide] and TBTF (tributyltin floride is summarized. Transport dynamics, including the migration of molecules through the dispersing unit and accumulation of the compound in the sites of toxic action, are discussed. Varying release rates, water quality effects, and adsorption by bottom soil, algae and plants are important variables in the use of these compounds. Transport through soil, degradation rates and mechanisms of action are also discussed. These compounds appear to be safe to fish, crayfish, aquatic plants and other nontarget biota. The hazards of these controlled release techniques are concluded to be less than those of the curren practices of mollusc control and the medicinals used in therapy of parasites hosted by molluscs. [Presented at the 6th Int. Symp. Controlled Release Soc.]

81-0953. Marlin, J. C. (Univ. Illinois, Urbana-Champaign, IL) **Ecological magnification of persistent organochlorine pesticides in an Illinois watershed.** *Diss. Abstr. Int. B* 41(6): 2052; 1980.

The concentration and ecological magnification of selected organochlorine pesticides in aquatic organisms of the Lake Decatur watershed in central Illinois were determined in this study. A review of the use of persistent organochlorine pesticides in the United States and the study area is provided. Samples of Pisces, Decapoda, Insecta, Gastropoda, Annelida, zooplankton and some amphibians and reptiles were tested for the presence of aldrin, dieldrin, DDT, DDE, heptachlor, heptachlor epoxide, and hexachlorobenzene. Concentration and ecological magnification data are presented for individual samples and samples grouped by taxa. The mean ecological magnification of individual pesticides did not vary substantially between taxa. (Author abstract by permission. Copies of the thesis are available from University Microfilms, order No. 8026556.)

81-0954. Chaudry, M. M. (Univ. Illinois, Urbana-Champaign, IL) **A. Chlorinated pesticides in soybeans, soybean oil, and its by-products during processing. B. Effect of thermal oxidation on mixtures of palm and soybean oil.** *Diss. Abstr. Int. B* 41(6): 2106-2107; 1980.

Soybean samples were collected from 7 different locales in Central Illinois and subjected to analysis for chlorinated pesticides. Different parts of the beans showed varying levels of residue concentrations. It was found that pesticide residues had a tendency to accumulate, in descending order, in hypocotyls, hulls, and cotyledons, on the basis of ground samples. When the oils extracted from the same fractions were analyzed, much higher concentrations of residues were located in hulls than hypocotyls, which had greater concentrations than cotyledons. Crude, refined, bleached, and deodorized oils, soapstock, Fuller's earth sludge, and deodorization condensate were analyzed for BHC isomers, heptachlor, heptachlor epoxide, aldrin, dieldrin, endrin, DDT, DDD (TDE) and DDE. None of the processing steps except deodorization were completely effective in the removal of chlorinated pesticide residues. Oil deodorized at 250°C under 1-5 mm pressure, was almost free of such residues, whereas all the residues were concentrated in the deodorizaton condensate. It is recommended that the hulls, and the oil processing by-products used in the animal feeds should be thoroughtly monitored for pesticides, and the waste materials should be disposed of properly, so as not to contaminate the environment. The effects of thermal oxidation on mixtures of palm and soybean oil are also discussed. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 8026461.)

81-0955. Burgett, M.; Fisher, G. C. (Dep. Entomol., Oregon State Univ., Corvallis, OR 97331) **Recovery of Penncap-M from foraging honey bees and pollen storage cells.** *Environ. Entomol.* 9(4): 430-431; 1980 (5 references).

Foraging honey bees (*Apis mellifera* L.), exposed to birdsfoot trefoil (*Lotus corniculatus* L.) bloom treated

with microencapsulated methyl parathion, continued to display pollen and midgut microcapsule contamination up to 9 days postspray. Nearly 10% of all pollen storage cells examined in combs taken from honey bee colonies exposed to the treated area were found to contain microcapsules. (Author abstract by permission)

81-0956. Dougherty, R. C.; Whitaker, M. J.; Smith, L. M.; Stalling, D. L.; Kuehl, D. W. (Dep. Chem., Florida State Univ., Tallahassee, FL 32306) **Negative chemical ionization studies of human and food chain contamination with xenobiotic chemicals.** *Environ. Health Perspect.* 36: 103-117; 1980 (31 references).

The use of negative chemical ionization (NCI) mass spectrometry for screening of environmental samples for contamination with xenobiotic chemicals is described and discussed. The method is based on the fact that most man-made toxic substances are either oxidizing agents or alkylating agents or both, and thus will capture either thermal electrons or thermalize gas-phase nucleophiles to form anionic complexes in the gas phase. Biomolecules do not generally attach thermal electrons or gas phase nucleophiles. Three different clean-up procedures, (steam distillation, gel permeation and adsorption on activated carbon followed by elution with toluene) were used, and were followed by NCI mass spectrometry using a mixture of isobutane, methylene chloride, and oxygen as the reagent gas. The samples studies were fish tissue, human seminal plasma and human adipose tissue. Detection limits were on the order of 1 ppb. Fish samples were found to be contaminated with polychloronaphthalenes, polychlorostyrenes, polychlorobiphenyls, polychlorodibenzofurans and polychlorodibenzodioxins. Human seminal plasma was studied because there is evidence for a significant decrease in sperm density in United States males in the past 30 yr. Seminal plasma was found to be contaminated with pentachlorophenol (PCP), hexachlorobenzene, DDT metabolites, and polychlorobiphenyls. Most human adipose tissue samples contained polychlorobiphenyls, DDT metabolites, nonachlor and chlordane.

81-0957. Francis, B. M.; Hansen, L. G.; Fukuto, T. R.; Lu, P. Y.; Metcalf, R. L.* (Inst. Environ. Stud., Univ. Illinois, Urbana, IL 61801) **Ecotoxicology of phenylphosphonothioates.** *Environ. Health Perspect.* 36: 187-195; 1980 (27 references).

To characterize the toxicological properties of the phenylphosphonothioate pesticides leptophos and EPN their acute toxicity in target and nontarget organisms, their environmental degradation and persistence, and their chronic toxicity were studied. Five mg of pure [^{14}C]EPN, leptophos, or des-bromoleptophos (a contaminant and metabolite of leptophos) were applied to sorghum leaves in a terrestrial-aquatic model ecosystem. The system contained salt marsh caterpillars, mosquito larvae, fish, and water containing plankton, algae, daphnia, and snails. After 33 days, organisms and water samples were collected, weighed, and total bioaccumulation was determined by liquid scintillation counting and thin layer chromatography. The bioaccumulation factors for EPN in snail and fish were 12,561 and 346, respectively, and 21,232 (snail) and 972 (fish) for leptophos. They were markedly more persistent than parathion. Hens were treated with various doses of 18 organophosphorus esters, and attempts were made to correlate delayed neurotoxicity with σ. Toxicity studies on the housefly using various organophosphorus esters have shown that acute toxicity to insects was highly correlated with $\Sigma\sigma$ of the substituted phenyl group, while acute toxicity to mammals (data from published literature) was slightly less well correlated, and neurotoxicity was poorly correlated with σ.

81-0958. Ribeyre, F.; Delarche, A.; Boudou, A. (Lab. Ecol. & Ecophysiol. Anim., Univ. Bordeaux 1, F-33405 Talence, France) **Transfer of methylmercury in an experimental freshwater trophic chain – temperature effects.** *Environ. Pollut. Ser. B* 1(4): 259-268; 1980 (21 references).

An experimental 4 level aquatic trophic chain was used to study the bioaccumulation and bioamplification of methylmercury. The proportion of pollutant was measurable at each trophic level, and transfer rates from one level to the others could be calculated. Consumer levels were contaminated either directly or globally. Experiments were conducted at 3 temperatures to investigate the effect of thermic factors on the contamination procedure. At 18°C the global rate of trophic transfer of mercury between the water and the terminal consumer was about 15%. When the concentration was 1 μg/l of contaminant in the water, mercury levels measured in *Salmo gairdneri* after 30 days of direct and trophic contamination were > 700 μg. Mercury levels measured in the terminal consumers demonstrated a reduction in the transfer rate when the water temperature was raised.

81-0959. Unger, M.; Olsen, J. (Dep. Commun. Health & Environ. Med., Sch. Med., Odense Univ., DK-500 Odense C, Denmark) **Organochlorine compounds in the adipose tissue of deceased people with and without cancer.** *Environ. Res.* 23(2): 257-263; 1980 (19 references).

A statistically significant correlation was demonstrated between the content of PCB and DDE in lipids extracted from subcutaneous abdominal tissue of terminal patients and their age. A higher concentration of PCB and DDE was found in extracted lipids of adipose tissue samples from terminal cancer patients (malignant lymphoma, retroperitoneal carcinoma, glioblastoma, adenocarcinoma, cancer of the breast, mesothelioma, carcinoma of the cervix, pulmonary carcinoma, cancer of the rectum, cancer of the colon, lymphosarcoma, etc.) than in the adipose tissue of patients who died of other diseases.

This difference was statistically significant. The results are discussed and the need for further investigations of a possible cause-effect relationship between exposure to organochlorine compounds and neoplasias is stressed. (Author abstract by permission of Academic Press)

81-0960. de Lappe, B. W.; Risebrough, R. W.; Springer, A. M.; Schmidt, T. T.; Shropshire, J. C.; Letterman, E. F.; Payne, J. R. (Bodega Mar. Lab., Univ. California, Bodega Bay, CA 94923) **The sampling and measurement of hydrocarbons in natural waters.** *Environ. Sci. Res.* 16: 29-68; 1980 (63 references).

Two approaches to the problem of obtaining seawater samples with reduced or known levels of contamination are considered. An *in situ* sampling system and the use of the Bodega-Bodman sampler were designed to obtain samples of 90 *l* throughout a water column down to 10 m above the bottom. A modified Slocum Sampler provided collection of a separate particulate fraction that is retained on a glass fiber filter mounted in-line with a column that extracts the dissolved components. Concentrations of PCB and ΣDDT in the dissolved phase of seawater samples from Southern California Bight samples, obtained with the Bodega-Bodman Samplers in the summer of 1977, are discussed. Similar data are presented for the coastal zone of Cape Cod, including Buzzard's Bay, and for western Lake Ontario. Levels of total hydrocarbons, mixtures of petrogenic and biogenic compounds, in seawater of the Southern California Bight in 1977 were generally less than 1 μg/l; this is lower than most reported values for total hydrocarbons in seawater.

81-0961. Miles, J. R. W. (Res. Inst., Agric. Canada, London, Ontario N6A 5B7, Canada) **Adsorption of insecticide residues – importance in environmental sampling and analysis.** *Environ. Sci. Res.* 16: 81-90; 1980 (4 references).

Insecticide residues found in organic soil of the Holland Marsh, an important vegetable growing area north of Toronto, Ontario, are discussed. DDT residues averaged about 29 ppm, some individual farms had DDT levels as high as 60 ppm and ethion up to 25 ppm. The marsh is surrounded by dikes and the farm tiles drain into a ditch from which water is pumped, when necessary. Dieldrin and diazinon concentrations in sediment from this area are also reported. It became apparent that once an insecticide was adsorbed on sediment, its condition did not remain static. A significant conversion of DDT to its metabolites DDE and DDD (TDE) was noted in bottom sediments. Insecticides adsorbed on the soil were subjected to desorption by irrigation water, rain, or soil erosions. Closely related to movement of pesticides through adsorption and desorption was the mobility through the soil. The mobility of DDT, dieldrin, ethion, lindane, diazinon and carbaryl through Plainfield sand and a high organic muck were measured. Laboratory studies were also conducted concerning the solubilities of various organochlorine insecticides.

81-0962. Peterman, P. H.; Delfino, J. J.; Dube, D. J.; Gibson, T. A.; Priznar, F. J. (Lab. Hyg., Univ. Wisconsin, Madison, WI 53706) **Chloro-organic compounds in the Lower Fox River, Wisconsin.** *Environ. Sci. Res.* 16: 145-160; 1980 (19 references).

During 1976-77, ~ 250 samples were taken from the Lower Fox River in Wisconsin and subjected to analysis by GC and GC/MS techniques. A total of 105 compounds were identified and another 20 compounds were characterized but not clearly identified. Of the 105, 20 compounds were on the EPA Priority Pollutant List, including DDT and chlordane. While the fate, long-term health and ecological implications of many of these compounds require further research, some effects are already known. PCBs and some organochlorines have a direct correlation between concentrations in wastewaters and suspended solids concentration. Concentrations of PCBs and other organochlorines were related to point source discharges.

81-0963. Peakall, D. B.; Fox, G. A.; Gilman, A. P.; Hallett, D. J.; Norstrom, R. J. (Natl. Wildl. Res. Cent., Canadian Wildl. Serv., Ottawa, Ontario K1A 0E7, Canada) **Reproductive success of herring gulls as an indicator of Great Lakes water quality.** *Environ. Sci. Res.* 16: 337-344; 1980 (15 references).

Use of the herring gull as an indicator species to study the presence of organic contaminants in the Great Lakes Region is reviewed. The herring gull diet consists of a wide variety of food and the bird is therefore an indicator of overall pollution in the area. The various criteria which make the gull suitable for use as an indicator species are reviewed. A trans-Canada comparison of DDE levels in eggs was conducted in 1974-75. Eggs from coastal areas contained only 5-10% of the residues found in the Great Lake Region and the coastal PCB levels were only 1-5% of Great Lakes egg levels. The only area reporting organochlorine levels comparable to those found near the Great Lakes is the Baltic Sea. Analysis of organochlorines have been carried out on the herring gull eggs collected from the Great Lakes since 1973. While effects such as increased incidence of abnormal young and poor reproductivity correlated with a high pollutant load, a firm cause and effect relationship has not yet been proven.

81-0964. Gummer, W. D. (Water Qual. Branch, Fish. & Environ. Canada, Regina, Saskatchewan S4P 3R4, Canada) **Pesticide monitoring in the prairies of Western Canada.** *Environ. Sci. Res.* 16: 345-372; 1980 (35 references).

Widespread distribution of 2,4-D, 2,4,5-T, γ-BHC (lindane), and α-BHC was noted in western Canada surface waters during pesticide monitoring programs conducted from 1971 to 1977. Simultaneously limited occurrences of dichlorprop, aldrin, and β-endosulfan were also noted. The wide distribution of lindane and α-BHC was attributed to atmospheric transportation and deposition. Isomerization of lindane to the α-BHC isomer is also suggested to account for some of the occurrence of the latter compound. At times the concentration of lindane and α-BHC each exceeded 0.01 μg/l. Agricultural areas contained most of the 2,4-D residues; concentrations were generally above 0.01 μg/l and reached as high as 4.33 μg/l. Industries and municipalities were also found to contribute to the presence of pesticides to the aquatic environment.

81-0965. Strachan, W. M. J.; Huneault, H.; Schertzer, W. W.; Elder, F. C. (Canada Cent. Inland Waters, Burlington, Ontario L7R 4A6, Canada) **Organochlorines in precipitation in the Great Lakes region.** *Environ. Sci. Res.* 16: 387-396; 1980 (10 references).

A total of 81 rain and 17 snow samples were collected from the Canadian shores of the Great Lakes and from inland sites during 1976 and 1977. Each site of sample collection was remote from industrial or urban contamination. In most of the samples, quantifiable levels of PCBs, α-BHC, lindane, DDT, endosulfan, dieldrin and methoxychlor were found. Infrequently HCB (hexachlorobenzene) and chlordane were also found. No levels of heptachlor, heptachlor epoxide, aldrin, endrin, or mirex were detected. Levels of the compounds were, in general, similar in 1976 and 1977; except for an increase of α-BHC in 1977. Snowmelt levels were considerably lower than rain water concentrations of contaminants. No specific region could be pinpointed as a source for these contaminants. Most substances appeared to be associated with particulate deposition during rainfall.

81-0966. Wegman, R. C. C.; Greve, P. A. (Natl. Inst. Public Health, Bilthoven, The Netherlands) **Halogenated hydrocarbons in Dutch water samples over the years 1969-1977.** *Environ. Sci. Res.* 16: 405-415; 1980 (4 references).

Boat sampling trips along the Rhine River from Rheinfelden, Switzerland, to Rotterdam, The Netherlands, were performed to determine the source of organochlorine discharges contaminating the river. From 1969 to 1977 a total of 1826 samples were taken from 99 sites and the samples were analyzed for hexachlorobenzene (HCB), α-BHC, β-BHC, lindane, heptachlor, heptachlor epoxide, dieldrin, endrin, *o,p'*-DDT, *p,p'*-DDT, *p,p'*-DDE, TDE, α- and β-endosulfan, PCBs, and extractable organic chlorines (EOCl). Very low frequencies of occurrence were noted for β-BHC, aldrin, heptachlor, heptachlor epoxide, and endrin. The highest concentrations of organochlorine pesticides and related substances were found in the Rhine River and its tributaries. Concentrations in the Meuse River were much lower and other surface waters contained even lower or non-detectable concentrations. The source of the α- and β-BHC and γ-BHC (lindane) contamination was located between Basel and Karlsruhe. The high concentrations of EOCl in Rhine water samples were not correlated to the concentrations of HCB, α- or γ-BHC, or PCBs.

81-0967. Guy, R. D.; Narine, D. R. (Trace Anal. Res. Cent., Dep. Chem., Dalhousie Univ., Halifax, Nova Scotia B3H 4J1, Canada) **A model system for the investigation of methods of herbicide speciation.** *Environ. Sci. Res.* 16: 417-434; 1980 (21 references).

A model system is presented which is suitable for the testing of speciation schemes for paraquat, diquat, simazine, atrazine and carbamate herbicides. A viable model system must include individual components from each of the four major compartments of the aquatic system; sediment; suspended particulates; soluble salts and organic compounds; and biota. This paper describes the interactions between the individual components (herbicide-clay, herbicide particulates and herbicide-algae) . The behavior in a complicated system (herbicide-algae- particulates) is illustrated. A speciation scheme based on size fractionation is suggested. It was concluded that a clay-particulate-algae system contains the essential components for herbicide studies and that algae are useful biological monitors for herbicides but are limited by variable sensitivity to other organic molecules. The humic acid-methylene blue system illustrated that while particulates adsorb the herbicides they also prolong toxic herbicidal effects by slowly releasing them into the aquatic environment.

81-0968. Smith, J. H.; Bomberger, D. C. (SRI Int., Menlo Park, CA 94025) **Prediction of volatilization rates of chemicals in water.** *Environ. Sci. Res.* 16: 445-451; 1980 (12 references).

Studies are presented which suggest that volatilization can be an important mechanism for the transfer of many pollutants from water bodies and wastewater treatment facilities to the atmosphere. It is possible that this is the major environmental pathway for nonpolar chlorinated compounds, nonpolar aliphatic hydrocarbons, and aromatic hydrocarbons (molecular wt < 150) to reach the atmosphere. Estimates of volatilization rate constants can be made for less volatile compounds by the model described. Where photolysis and biodegradation mechanisms are slow or non-existent, volatilization becomes an important process in the release of less volatile compounds to the ambient environment. Mirex and methyl parathion volatilization rate data indicate they are members of this latter group.

81-0969. Van Rensburg, J. F. J.; Hassett, A. J. (Natl. Inst. Water Res., Counc. Sci. & Ind. Res., Pretoria 0001, South Africa) **Screening South African drinking-waters for organic substances hazardous to health.** *Environ. Sci. Res.* 16: 461-472; 1980 (18 references).

A preliminary screening program for 11 toxic compounds was introduced to estimate the health risks associated with South African drinking water. Among these compounds are volatile halogenated hydrocarbons, chlorinated hydrocarbons (lindane, chlordane, dieldrin, hexachlorobutadiene, hexachlorobenzene, PCBs, and dichlorobenzene), chlorophenols (PCP) and polynuclear aromatic hydrocarbons. The extraction techniques employed gave recoveries of greater than 70%. Overall the method reproducibility had less than 20% standard deviation, except for PCP. Sampled waters were of excellent quality; no polynuclear aromatic hydrocarbons were found above the minimum limits except for fluoranthene. Volatile halogenated hydrocarbons occurred up to a maximum of 40 μg/l, and chlorophenols were present in a range of 1 to 10 μg/l. Only one water source contained chlorinated hydrocarbons (BHC-isomers) within the range of 0.1 to 1 μg/l.

81-0970. Kalas, L.; Mudroch, A.; Onuska, F. I. (Natl. Water Res. Inst., Canada Cent. Inland Waters, Burlington, Ontario L7R 4A6, Canada) **Bioaccumulation of arene and organochlorine pollutants by *Cipangopaludina chinensis* (Gray 1834) (Mollusca: Gastropoda) from ponds in the Royal Botanical Gardens, Hamilton, Ontario.** *Environ. Sci. Res.* 16: 567-576; 1980 (21 references).

Polynuclear aromatic hydrocarbons (PAH) and polychlorinated biphenyls (PCBs) were determined in cyclohexane and *iso*-octane:benzene extracts of soft tissues of *Cipangopaludina chinensis* by gas chromatography and mass spectrometry. Pond water and bottom sediments were also analyzed for aromatic hydrocarbon pollutants. In the water sample PCB levels were < 0.02 μg/l. Heptachlor, aldrin, heptachlor epoxide, *p,p'*-DDD (TDE), endrin, α- and β-endosulfan, methoxychlor, and α-BHC were not detected. Levels for other organochlorines were 0.001 μg/l for lindane and dieldrin and < 0.001 μg/l for *p,p'*-DDE, *p,p'*-DDT, α-chlordane and γ-chlordane. PAH and PCB levels in *C. chinensis* were 1497.6 and 600.00 μg/kg dry wt. PAH levels in sediments were 23.20 μg/kg dry wt. PCBs were not determined in sediments.

81-0971. Eisenreich, S. J.; Looney, B. B.; Thornton, J. D. (Univ. Minnesota, Minneapolis, MN 55455) **Airborne organic contaminants in the Great Lakes ecosystem.** *Environ. Sci. Technol.* 15(1): 30-38; 1981 (42 references).

A report is presented on results of analyses for airborne organic contaminants in the Great Lakes region. The susceptibility of the area for input of organics as well as the deposition processes is considered. Among the organics discussed are the pesticides dieldrin, lindane, aldrin and DDT. The relative contributions of dry and wet deposition are discussed. The concentrations of several pesticides in air compared to precipitation are dieldrin 0.05 and 2, hexachlorobenzene 0.2 and 2, DDT 0.03 and 5, α-BHC 0.3 and 15, γ-BHC 2 and 5, and α-endosulfan 1 ng/m³ (air) and 2 ng/l (water), respectively. Further attempts to identify existing atmospheric sources of organics and eliminate them by designing more effective means of disposing of toxic organics are recommended.

81-0972. Gromov, V. L.; Gromova, V. S. (Inst. Ind. Hyg. Agric., Orel, USSR) **Rol'pestitsidov v formirovanii neblagopriiatnykh uslovii truda pri propolke sakharnoi svekly. [Role of herbicides in creation of unfavorable working conditions during weeding of sugar beet.]** *Gig. Tr. Prof. Zabol.* (11): 43-44; 1980 (4 references) (Russian).

The results of evaluation of working conditions during treatment of sugar beet crop with the herbicides hexachlorocyclohexane (HCCH; BHC) and sodium trichloroacetate (sodium TCA; STCA) are reported. It was found that the dust collected at the sugar beet fields contained HCCH and its metabolites. Experiments in human embryo fibroblasts showed that the median cytotoxic dose of the dust from sugar beet fields was 0.03-0.05 mg/ml, compared with 2.7-3.2 mg/ml for the dust from control soils. The air of the working zone did not contain pesticides, but toxic chlorine-containing gases (hydrogen chloride and phosgene) were detected.

81-0973. Archer, T. E.; Gauer, W. O. (Dep. Environ. Toxicol., Univ. California, Davis, CA 95616) **Levels of DCPA, MTP, TPA, and hexachlorobenzene in radish roots and tops.** *HortScience* 15(2): 146-147; 1980 (5 references).

Residues of the herbicide DCPA, its metabolites MTP (monomethyl-2,3, 5,6-tetrachloroterephthalate) and TPA (2,3,5,6-tetrachloroterephthalic acid, and the contaminant HCB (hexachlorobenzene) were determined in tops and roots of radish (*Raphanus sativus* L.). The herbicides were applied as a soil treatment for pre-emergence control of weeds under commercial field conditions. HCB was determined in radish tops and roots at the 8.97 and 17.94 kg/ha rate of application, but not at the 4.48 kg/ha rate of application. HCB residues were twice the levels (0.001-0.010 ppm) in radish tops but not in the roots at the higher rate. No significant residues were detected in either tops or roots at the application rate of 8.97 kg/ha. DCPA residues in radish roots after application of 4.48 kg/ha ranged from 0.01 to 0.05 ppm. After application of 8.97 kg/ha residues were 0.01-0.04 ppm. At the 17.94 kg/ha application rate residues were 0.07-0.22 ppm. Levels of MTP and TPA in radish roots ranged from less than 0.01 to 0.04 ppm and 0.01 to 0.02 ppm at the 4.48 hg/ha rate, respectively. It was concluded that DCPA, MTP, TPA and HCB

were detected in significant amounts in the tops and in only trace amounts in the roots of radishes under these treatment conditions.

81-0974. Carlson, D. A.; Bailey, D. L. (Insects Affecting Man & Anim. Res. Lab., Agric. Res., SEA, USDA, Gainesville, FL 32604) **Determination of mosquito chemosterilant recovered from air during real and simulated use.** *J. Agric. Food Chem.* 29(1): 78-82; 1981 (14 references).

Many studies have documented volatilization of pesticides from water and treated surfaces, especially water-insoluble chlorinated hydrocarbons. The recovery of a water-soluble chemosterilant, bisazir [*p,p*-bis(1-aziridinyl) -*N*-methylphosphinothioic amide] from the air during simulated use is reported. When samples were obtained by drawing air at 0.5 l/min through porous polymer sampling tube suspended above pans containing 1% solutions of the material, analysis by GLC-FPD showed concentrations in air of 100-700 ng/l. When this sampling method was used at a remote work station, 9-54 ng/l of the material was recovered from the air during and after working hours in the work area. Installation of a second vent fan reduced quantities found by 50-80% in 3 tests. The vapor pressure of this chemosterilant was estimated by comparison of GLC retention times of *n*-paraffins to be 5 μm (5×10^{-3} mmHg) at 25°C, which is considered highly volatile. Vapor pressures of hempa, tepa, and thiotepa were found to be 19.5, 3.5, and 1.5 μm, respectively, at 25°C by this same method. (Author abstract reprinted by permission of the American Chemical Society)

81-0975. Beeman, R. W.; Matsumura, F. (U.S. Grain Mark. Res. Lab., Manhattan, KS 66503) **Metabolism of *cis*- and *trans*-chlordane by a soil microorganism.** *J. Agric. Food Chem.* 29(1): 84-89; 1981 (15 references).

Chlordane is an environmentally persistent soil insecticide, particularly useful in the protection of wooden structures from termite damage. A slow change was found to occur in the composition of soil residues of technical chlordane, suggestive of chemical or biological transformation of certain components. An actinomycete (*Nocardiopsis* sp.) isolated from soil was capable of extensively degrading chlordane in pure culture. Growing broth cultures of *Nocardiopsis* metabolized pure *cis*- or *trans*-chlordane to at least 8 solvent-soluble substances including dichlorochlordane, oxychlordane, heptachlor, heptachlor *endo*-epoxide, chlordane chlorohydrin, and 3-hydroxy-*trans*-chlordane. Identifications were based on gas chromatographic or mass spectroscopic analysis. Oxychlordane was metabolically inert, and accumulated in the mycelium as a terminal residue. patterns of metabolic activity in microorganisms were compared to the residue patterns in chlordane-treated soil. (Author abstract reprinted by permission of the American Chemical Society)

81-0976. Adhya, T. K.; Sudhakar-Barik; Sethunathan, N.* (Lab. Soil Microbiol., Cent. Rice Res. Inst., Cuttack 753006, India) **Stability of commerical formulation of fenitrothion, methyl parathion, and parathion in anaerobic soils.** *J. Agric. Food Chem.* 29(1): 90-93; 1981 (12 references).

The relative stability of formulated emulsifiable concentrates of fenitrothion, methyl parathion, and parathion in an anaerobic soil was studied by using two approaches. When the formulated pesticides were applied to 10-day preflooded soil, followed by continued incubation of soil samples under static flooded conditions, degradation of parathion proceeded essentially by nitro group reduction and of methyl parathion and fenitrothion by hydrolysis. In contrast, all three insecticides were degraded by nitro group reduction to their respective amino analogues in the second approach involving direct equilibration of the pesticide with the soil prereduced by flooding for different periods. Interestingly, rapid nitro group reduction of all organophosphates, parathion in particular, occurred within 5 sec of their equilibration with a soil prereduced by incubation with rice straw under flooding. Sterilization of the prereduced soil by autoclaving prevented the rapid destruction of the pesticides by the prereduced soil. (Author abstract reprinted by permission of the American Chemical Society)

81-0977. McCall, P. J.; Vrona, S. A.; Kelley, S. S. (Residue Environ. Metab. Res., Agric. Prod. Dep., Dow Chem. USA, Midland, MI 48640) **Fate of uniformly carbon-14 ring labeled 2,4,5-trichlorophenoxyacetic acid and 2,4-dichlorophenoxyacetic acid.** *J. Agric. Food Chem.* 29(1): 100-107; 1981 (12 references).

Laboratory studies were conducted with uniformly ^{14}C ring labeled 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) and 2,4-dichlorophenoxyacetic acid (2,4-D) to determine degradation kinetics in a number of soils and to trace the fate of the ring carbon in the degradation process. Degradation rates were not simple first order but generally increased until ~20% of the chemical remained, after which they declined. Average 50% decomposition times of 4.0 and 14 days were observed for 2,4-D and 2,4,5-T, respectively. Two major metabolites were observed in the degradation of 2,4,5-T: 2,4,5-trichlorophenol and 2,4,5-trichloroanisole. The anisole appears to be formed from the phenol through a microbial methylation process. Analogous metabolites were not observed for 2,4-D. Soil samples containing measurable levels of 2,4,5-trichloroanisole were subjected to further studies investigating volatility. The compound was found to be quite volatile with a 50% loss time from soil of 1-3 days. (Author abstract reprinted by permission of the American Chemical Society)

81-0978. Hill, B. D. (Res. Stn., Agric. Canada, Lethbridge, Alberta T1J 4B1, Canada) **Persistence and**

distribution of fenvalerate residues in soil under field and laboratory conditions. *J. Agric. Food Chem.* 29(1): 107-110; 1981 (13 references).

An analytical method is described for determining fenvalerate [*RS*)-α-cyano-3-phenoxybenzyl (*RS*)-2-(4-chlorophenyl)-3-methylbutyrate] residues in soil using hexane-acetone extraction, alumina microcolumn cleanup, and ^{63}Ni electron-capture gas chromatographic detection. Method recoveries ranged from 78.4 to 105% at the 0.005-1.0 ppm fortification levels. Methanol was an unsuitable solvent for residue analysis since fenvalerate exchanged the α proton with methanol, racemization occurred, and the amount of the *RS,SR* enantiomeric pair increased relative to that of the *RR,SS* pair. In a microplot field study, fenvalerate residues had an average half-life of 6 wk in the 0-2.5 cm soil layer. Residues were not readily leached down to the 2.5-5.0 cm soil layer and lateral surface movement was minimal. Fenvalerate had an average half-life of 5.2 wk in soil incubated in an environmental chamber. In both soil persistence studies, the *RS,SR* enantiomeric pair degraded slightly faster than the *RR,SS* pair. (Author abstract reprinted by permission of the American Chemical Society)

81-0979. Wong, A. S.; Crosby, D. G.* (Dep. Environ. Toxicol., Univ. California, Davis, CA 95616) **Photodecomposition of pentachlorophenol in water.** *J. Agric. Food Chem.* 29(1): 125-130; 1981 (33 references).

Exposure of aqueous pentachlorophenol (PCP) solutions to either sunlight or laboratory ultraviolet light resulted in rapid degradation at pH 7.3 and slower degradation at pH 3.3. Displacement of chloride by hydroxide produced tetrachlorocatechol, tetrachlororesorcinol, and tetrachlorohydroquinone which subsequently were air-oxidized to chloranil, hydroxyquinones, and eventually 2,3-dichloromaleic acid (DCM). This acid photodecomposed more slowly to carbon dioxide, chloride, and unidentified organic fragments. Photoreduction of PCP to tetra- (TCP) and trichlorophenols also occurred, as did formation of a cyclic diketone, $C_5H_2Cl_2O_2$. Examination of local field waters revealed PCP and TCP but no DCM. (Author abstract reprinted by permission of the American Chemical Society)

81-0980. Iwata, Y.; Carman, G. E.; O'Neal, J. R.; Barkley, J. H.; Duesch, M. E.; Gunther, F. A. (Dep. Entomol., Univ. California, Riverside, CA 92521) **Phenthoate applied to California citrus trees: residue levels on foliage and soil, in air, and on and in fruit.** *J. Agric. Food Chem.* 29(1): 135-145; 1981 (17 references).

Phenthoate {Cidial, ethyl α-[(dimethoxyphosphinothioyl)thio]benzeneacetate} was field applied to California orange, lemon, and grapefruit trees. Applications included two dilute spray rates and one low-volume rate. Residue levels of phenthoate and its oxygen analog (oxon) were determined for assisting in setting worker reentry safety intervals and legal fruit tolerances. The half-lives for the dissipation of phenthoate from orange, lemon, and grapefruit rind were 15 ± 1, 20 ± 8, and 20 ± 5 days, respectively. The maximum rind residue of phenthoate oxon was 0.09 ppm in orange rind. No determinable phenthoate residues (> 0.03 ppm) were found in the edible portion of the citrus fruits. Dislodgeable phenthoate residues dissipated rapidly from foliage. The half-lives were 3.6 ± 0.3 and 3.1 ± 0.3 days for phenthoate dissipation from orange and lemon foliage, respectively. The maximum oxon level found was 0.07 μg/cm² of leaf surface. Phenthoate appeared to persist longer on orange fruit surfaces ($t_{1/2}$ = 10 days) than on the corresponding foliar surfaces ($t_{1/2}$ = 3.9 days). Phenthoate dissipation from soil dust on the grove floor after a 7.5 lb of AI/1500 gal/acre (8.4 kg of AI/140 hl/ha) application had a $t_{1/2}$ value of 29 days. The highest level of phenthoate and its oxon found were 180 and 30 ppm, respectively. Air samples collected from under a tree after a 7.5 lb of AI/100 gal/acre (8.4 kg/9.4 hl/ha) application contained 10 μg of phenthoate/m³ at 3-days postapplication and lesser amounts thereafter. (Author abstract reprinted by permission of the American Chemical Society)

81-0981. Trimnell, D.; Shasha, B. S.; Doane, W. M. (North. Reg. Res. Cent., Agric. Res., SEA, USDA, Peoria, IL 60604) **Degradation of diazinon encapsulated with starch xanthate.** *J. Agric. Food Chem.* 29(1): 145-148; 1981 (18 references).

The degradation of diazinon encapsulated with starch xanthate (SX) cross-linked by various reagents was studied under accelerated aging conditions at 70°C in the presence and in the absence of reported stabilizers. Stability of diazinon was unchanged by most of these stabilizers. Acidity from the decomposition of SX-encapsulated diazinon decreased the stability. Stability was increased by adding water, keeping the xanthate degree of substitution low, increasing the diazinon loading, and adding alkaline substances to neutralize acidic decomposition products. Calcium oxide was particularly helpful in stabilizing the preparations. (Author abstract reprinted by permission of the American Chemical Society)

81-0982. Mudd, P. J.; Hance, R. J.; Greaves, M. P.; Wright, S. J. L. (Sch. Biol. Sci., Univ. Bath, Bath BA2 7AY, England) **Herbicide effects and fate in the rhizosphere of wheat.** *J. Appl. Bacteriol.* 49(3): viii; 1980.

Field, greenhouse, and laboratory experiments on the effects of the urea herbicide isoproturon on microbial populations were conducted. Effects were studied in the rhizosphere of wheat and in plant-free soil. Under field conditions with isoproturon applied at the recommended rate of 2.5 kg/ha, effects were variable and included temporary increases and decreases in bacterial and fungal pro-

pagules, but no changes in levels of NH_4^+-N, NO_2^--N, NO_3^--N or PO_4^{3-}. In the laboratory, isoproturon at levels equivalent to normal and 10 times the field application rates did not affect growth in liquid media of pure cultures of fungi and bacteria isolated from the wheat rhizosphere. However, in agar medium, the growth of several fungi, including the pathogen *Gaeumannomyces graminis*, was affected (increases and decreases in radical growth, mycelial density, sporulation and pigmentation) at levels equivalent to normal, 10 times and 50 times the field rate. In greenhouse studies isoproturon was shown to degrade more rapidly in soil planted with wheat than in unplanted soil; the degradation pathway was the same in both planted and unplanted soils.

81-0983. Kavanagh, B. V.; Posner, A. M.; Quirk, J. P. (Dep. Soil Sci. & Plant Nutr., Univ. West. Australia, Nedlands, WA 6009, Australia) **Effect of adsorption of phenoxyacetic acid herbicides on the surface charge of goethite.** *J. Soil Sci.* 31(1): 33-39; 1980 (8 references).

Surface charge measurements indicate that the adsorption of herbicide ions on goethite causes an increase in the positive charge of the mineral surface. An increasing selectivity in the adsorption of MCPA was noted with a decrease in solution pH, which indicated an increasingly favorable value for the free energy of adsorption. It is noted that van der Waals interactions were considerably less important in determining the adsorption behavior of phenoxyacetic acid than of MCPA. Phenoxyacetic acid did not display surfactant properties, such as flotation, exhibited by other compounds.

81-0984. Reish, D.; Rossi, S. S.; Mearns, A. J.; Oshida, P. S.; Wilkes, F. G. (California State Univ., Long Beach, CA) **Marine and estuarine pollution.** *J. Water Pollut. Control Fed.* 51(6): 1477-1517; 1979 (385 references).

Literature on the effects of pesticides on marine organisms, aquatic environmental research methods, bioaccumulation of pesticides by estuarine and marine organisms, and biota residues is reviewed. Studies concerned with the environmental effects of dredging and the occurrence of disease and other abnormalities among shellfish and marine plants are also reported. Specific pesticides covered include acrolein, dalapon, dichlobenil, diquat, endothal, 2,4-D BEE, *o*-dichlorobenzene, temephos, chlorpyrifos, BHC, DDT, chlordane, heptachlor, captan, toxaphene, methoxychlor, malathion, carbofuran, trifluralin, DEF, lindane, PCP, the juvenile hormone analog ZR-515, endrin, dieldrin, and endosulfan.

81-0985. Zhuravleva, I. P.; Andreeva, E. P.; Burobina, G. S. (Reg. Agrochem. Lab., Leningrad, USSR) **Toksikologicheskaya gruppa v Leningradskoi oblastnoi agrokhimicheskoi laboratorii. [Toxicological group of Leningrad regional agrochemical laboratory.]** *Khim. Sel'sk. Khoz.* 18(10): 9-11; 1980 (3 references) (Russian).

Objectives of the Toxicological Group of the Leningrad Agrochemical Laboratory are described. Since 1976 the group has been involved in close monitoring of hexachlorocyclohexane (HCCH; BHC) residues in soil and crops. It was found that systematic use of HCCH results in its accumulation in the soil. Decrease of its levels in the arable layer is due to degradation and translocation of residues into plants and the subarable layer. This is concluded to explain detection of HCCH in the arable layer and in the plants several years after termination of its application.

81-0986. Zhitov, V. V.; Krest'ianinova, N. G.; Loshkareva, F. I.; Sokolova, N. F. (Reg. Agrochem. Lab., Irkutsk, USSR) **Khimiko-toksikologicheskaya sluzhba v Irkutskoi Oblastnoi agrokhimicheskoi laboratorii. [Chemical-toxicological service of Irkutsk regional agrochemical laboratory.]** *Khim. Sel'sk. Khoz.* 18(10): 11-12; 1980 (3 references) (Russian).

The goals of Chemical-Toxicological Service of the Irkutsk regional agrochemical laboratory are described. The main objective of the service, created in 1974, was the control of pesticide residues and evaluation of the degradation and accumulation of organochlorine pesticides, metaphos (methyl parathion), chlorophos (trichlorfon), 2,4-D and nitrates. Small-plot and industrial trails showed that residues of hexachlorocyclohexane (HCCH; BHC) could be detected in gray soils for at least 2-3 yr. Repeated treatment was found to increase HCCH residues in the soil and in the crops. The rate of HCCH accumulation in the carrot was significantly greater than the rate of accumulation in cabbage and potato. Analysis of the degradation of amine salt of 2,4-D in the spring wheat crops showed that herbicides can accumulate in the plants in the technical ripeness phase.

81-0987. Pal'chuk, L. M.; Litvinenko, V. V.; Bestaka, R. P. (Kirovograd Reg. Agrochem. Lab., Kirovograd, USSR) **Ostatochnye kolichestva pestitsidov v pochve i rasteniiakh v severnoi stepi USSR. [Pesticide residues in soil and plants in the northern steppe of Ukrainian SSR.]** *Khim. Sel'sk. Khoz.* 18(10): 39-41; 1980 (7 references) (Russian).

Degradation of a series of organochlorine and organophosphorus pesticides in soil and plants was studied. Pesticide residues were determined by thin layer chromatography. It was found that spring application of atrazine and polyatrazine in maize crop and prometryne in sun flower crop resulted in maximum accumulation in the green parts (0.20-0.30 mg/kg) 2 mo after application at 2-3 kg/ha. Pesticide levels decreased, and at harvest did not exceed 0.03 mg/kg. Chlorophos (trichlorfon) showed com-

plete degradation within 45-50 days. Despirol (Kelevan; ENT 2754) was inactivated within 80 days. The organochlorine pesticides DDT, polychloropinene, and HCCH (BHC) could be detected in oat, sugar beet and other crops 1-1.5 yr after application in amounts that did not exceed the MPC.

81-0988. Vorob'eva, T. N. (North. Caucasus Reg. Res. Inst. Hortic. & Vinic., USSR) **Ostatki euparena v iagodakh vinograda. [Euparen residues in grapes.]** *Khim. Sel'sk. Khoz.* 18(10): 41-42; 1980 (4 references) (Russian).

The results of determination of the fungicide Euparen (*N*, *N*-dimethyl-*N*'-phenyl *N*-fluorodichloromethylthiosulfamide; dichlofluanid) in grapes are reported. Vineyards were treated with Euparen at 0.4% and 0.2% (AI) concentrations. Grapes were collected 1, 3, 8 and 16 days after treatment, and Euparen residues were determined by thin layer chromatography. Immediately after treatment Euparen residues were 8-16 mg/kg. Later, Euparen levels showed a progressive decline (9 mg/kg after treatment with 0.4% fungicide and 3 mg/kg after treatment with 0.2% fungicide). Euparen degradation was enhanced significantly by increased humidity.

81-0989. Vorob'eva, T. N. (North. Caucasus Res. Inst. Hortic. & Vinic., USSR) **Ostatochnye kolichestva geksakhlorobutadiena v pochve. [Hexachlorobutadiene residues in soil.]** *Khim. Sel'sk. Khoz.* 18(11): 39-40; 1980 (3 references) (Russian).

The results of determination of residues of the fumigant hexachlorobutadiene (HCBD) in soil are reported. Vineyards infected with phylloxera were treated with HCBD at 250 kg/ha. The maximum level of HCBD was detected 8 mo after the last application (4.36 mg/kg in the 75-100 cm layer and 7.3 mg/kg in the 50-75 cm layer); HCBD levels 32 mo after application in the 50-75 cm and 75-100 cm layers were 0.65 and 2.99 mg/kg, respectively.

81-0990. Fowler, S. W.; Elder, D. L. (Int. Lab. Mar. Radioact., IAEA, Mus. Oceanogr., Monte Carlo, Monaco) **Chlorinated hydrocarbons in pelagic organisms from the open Mediterranean Sea.** *Mar. Environ. Res.* 4: 87-96; 1980 (23 references).

Levels of chlorinated hydrocarbons in pelagic organisms from the open Mediterranean Sea were determined. During April and July of 1977, pelagic macrozooplankton and nekton were sampled. Samples were extracted with hexane in a Soxhlet extractor and analyzed by electron capture gas chromatography. PCB values from collection at all stations (mixed plankton samples) ranged from 15 to 230 μg/kg. DDT ranged from 6.2 to 20 μg/kg, DDD ranged from 1.1 to 58 μg/kg, and DDE ranged from 2.5 to 13.6 μg/kg. The first voyage resulted in much higher levels of PCB in the samples than the second voyage. It is suggested that the highest levels were the result of contamination from the anti-fouling paint on the hull of the ship used during the first voyage. The results of these studies are compared to the findings from other oceanic areas.

81-0991. Menasveta, P.; Cheevaparanapiwat, V. (Dep. Mar. Sci., Chulalongkorn Univ., Bangkok, Thailand) **Heavy metals, organochlorine pesticides, and PCBs in green mussels, mullets, and sediments of river mouths in Thailand.** *Mar. Pollut. Bull.* 12(1): 19-25; 1981 (17 references).

Heavy metals, organochlorine pesticides, and PCBs were measured in green mussels, mullets, and sediments from the mouths of the four major rivers in central Thailand. Samples were analyzed for lead, zinc, copper and cadmium by flame atomic absorption spectroscopy, for mercury by the cold vapor atomic absorption method, and for organochlorine pesticides and PCBs by gas chromatography. No BHC was detected in mussels, mullets or sediment. Lindane, heptachlor, heptachlor epoxide, aldrin and DDT and its metabolites were detected in some mussel and mullet samples. The mean concentration of ΣDDT in mussel samples ranged from 0.032 to 0.042 μg/g, and in mullet from 0.022 to 0.089 μg/g. While no lindane, heptachlor epoxide, or PCBs were detected in sediments, trace amounts of heptachlor and aldrin were found, and DDT was found in some sediments ranging from 0.022 to 0.056 μg/g.

81-0992. Kilpi, S. (Dep. Gen. Microbiol., Univ. Helsinki, Helsinki, Finland) **Degradation of some phenoxy acid herbicides by mixed cultures of bacteria isolated from soil treated with 2-(2-methyl-4-chloro) -phenoxypropionic acid.** *Microb. Ecol.* 6(3): 261-270; 1980 (20 references).

Bacterial cultures, isolated from soil treated with the herbicide mecoprop for 3 yr, were used in studies on the biodegradation of MCPA, 2,4-D, mecoprop, and dichlorprop. Since attempts to isolate herbicide-degrading bacteria using a basal mineral salt solution with the herbicide as the sole source of carbon failed, new enrichments using a combination of two aromatic compounds were developed. The mixed cultures used were M1 (vanillic acid + MCPA), M2 (vanillic acid + dichlorprop), M3 (benzoic acid + MCPA), and M4 (benzoic acid + dichlorprop). Herbicide disappearance was determined by measurement of the UV absorption spectrum. With M1, M3, and M4, the bacteria first utilized the natural aromatic (exhausted after 18 hr), then the herbicide which disappeared after 64 hr. In culture M2, the bacteria used the vanillic acid, but not the dichlorprop. After 3 or 4 repetitions, M1 and M3 cultures began to utilize MCPA as a sole source of carbon. Even when these cultures were taken through 32 successive platings (3 mo) with glucose as the sole carbon source, they

retained their ability to degrade MCPA. In cross-adaptation test, it was determined that cultures M1 and M3 degraded MCPA and 2,4-D, but not mecoprop, dichlorprop, or 2,4,5-T. Culture M4 degraded MCPA, 2,4-D, mecoprop and dichlorprop, but not 2,4,5-T. In temperature studies, it was found that the optimal temperature for MCPA degradation was 28°C.

81-0993. Mueller, G.; Dominik, J.; Reuther, R.; Malisch, R.; Schulte, E.; Acker, L.; Irion, G. (Inst. Sedimentforsch., Univ. Heidelberg, D-6900 Heidelberg, BRD) **Sedimentary record of environmental pollution in the Western Baltic Sea.** *Naturwissenschaften* 67(12): 595-600; 1980 (24 references).

The history of environmental pollution in the western Baltic Sea is chronologically reviewed. Through the use of dated sediment cores it was determined that DDT was first found in sediments deposited around 1945. Within central Europe DDT was used in large amounts predominantly as an insecticide after 1945 and was later banned in several countries. The distribution pattern in the cores paralleled the application of DDT in the adjacent areas. γ-BHC (lindane) was first detected in sediments dated 1950; concentrations have continually increased since then. DDE levels in egg tissue fat have been decreasing since 1970. Decreased ΣDDT levels in fish were observed from 1975 to 1979. Radionuclides, nutrients, heavy metals, PCBs, lead, and phthalate esters are also reviewed.

81-0994. Isshiki, K.; Tsumura, S.; Watanabe, T. (Kita-Kyushu Munic. Inst. Environ. Sanit., Kita-Kyushu, Fukuoka, Japan) **[On the antifungal additives detected in citrus fruits and bananas sold in the market.]** *Nippon Koshu Eisei Zasshi (Jpn. J. Public Health)* 27(10): 639; 1980 (2 references) (Japanese).

The presence and amount of biphenyl (BP), *o*-phenylphenol (OPP), thiabendazole (TBZ) and esters of *p*-oxybenzoic acids in market citrus fruits and bananas were examined by gas chromatography, mass spectrometry and high speed liquid chromatography. None of these antifungal agents were detected in 38 samples of 10 locally grown fruits or 50 samples of imported banana. BP (1-60 ppm), OPP (1-7 ppm) and TBZ (1-3 ppm) were detected in imported grapefruits, lemons and oranges, respectively. Detection rates for these 3 agents simultaneously on one sample of grapefruit, lemon and orange were 25.5, 7.1 and 20.9, respectively.

81-0995. Soma, K.; Mukai, T.; Homma, T.; Maho, M.; Masuyama, K.; Arakawa, H. (Niigata Munic. Inst. Hyg., Niigata, Niigata, Japan) **[Investigation of the residue of chlorothalonil in crops and soils. Part 2.]** *Nippon Koshu Eisei Zasshi (Jpn. J. Public Health)* 27(10): 643; 1980 (Japanese).

Chlorothalonil residues were measured in 23 crop samples (10 different crop species), and in soil samples from the fields for these crops collected from May to November, 1979. Chlorothalonil was found in 16 crop samples; the maximum level was 0.543 ppm in eggplant. Chlorothalonil was found in 22 soil samples, with a maximum level of 11.392 ppm (mean = 3.561) in soil from the tomato field. Residues in watermelon ranged from not detectable (nd) to 0.003; soil levels were 0.003 to 0.237 ppm. Cucumber levels ranged from nd to 0.021 ppm; soil levels were 0.005-0.559 ppm. Levels in tomato ranged from nd to 0.318; soil contained nd to 11.392 ppm. Chlorothalonil residues in soil, to which no chlorothalonil was applied in 1979, decreased from 0.229 ppm (1978) to 0.145 ppm (1979) in cauliflower field; 0.147 ppm (1978) to 0.100 ppm (1979) in cabbage field; 0.093 ppm (1978) to 0.006 ppm (1979) in Chinese-cabbage field and 0.466 ppm (1978) to 0.297 ppm (1979) in Japanese radish *(Raphanus sativus)* field. Residues were relatively high in tomato, cucumber and eggplant compared to levels in cabbage, watermelon and strawberry. This is suggested to be due to the amount and the season of application of the fungicide. A positive relationship between residue levels in crop and soil was found for cucumber.

81-0996. Homma, I.; Mukai, T.; Maho, M.; Masuyama, K.; Soma, K.; Arakawa, H. (Niigata Munic. Inst. Hyg., Niigata, Niigata, Japan) **[Investigation on the residue of chlorinated cyclodienes – correlation of the residue between crop and soil.]** *Nippon Koshu Eisei Zasshi (Jpn. J. Public Health)* 27(10): 644; 1980 (Japanese).

Residues of aldrin, dieldrin and endrin in crops and soils were investigated. The rates of detection and mean concentrations of aldrin were 25% and 0.009 ppm in *Raphanus sativus*, 50% and 0.003 ppm in cucumber, and 50% and 0.001 ppm in tomato. None was detected in cabbage. Rates of detection and mean concentrations for dieldrin were 58.3% and 0.006 ppm in *R. sativus*, 62.5% and 0.002 ppm in cabbage, and 75% and 0.03 ppm in cucumber. Dieldrin was not detected in Chinese cabbage and tomato. Rate of detection and mean concentration of endrin were 50% and 0.001 ppm in cucumber. All other crops did not contain endrin. Aldrin was found in 47.4% of all soils at 0.003 ppm; dieldrin was found in 73.7% at 0.204 ppm; endrin was found in 21.2% at 0.006 ppm. These results were obtained 10 yr after the ban of chlorinated cyclodiene insecticide use in Japan. It was also noted that 1 Chinese cabbage sample and 2 cucumber samples contained aldrin levels higher than the threshold value.

81-0997. Yoshioka, Y.; Hosaka, H.; Kato, Y.; Saheki, M. (Chiba Prefect. Inst. Hyg., Chiba, Chiba, Japan) **[Investigation of harmful substances in foods produced in Chiba Prefecture – their contents and their translation with time.]** *Nippon Koshu Eisei Zasshi (Jpn. J. Public Health)* 27(10): 650; 1980 (Japanese).

ΣBHC, ΣDDT and dieldrin levels were examined in short-necked clams, carp, hen eggs and raw milk in 1975, 1977 and 1979. ΣBHC levels in carp decreased from 0.007 in 1975 to 0.003 ppm in 1979. However, in clams and milk, the level was almost constant at 0.001 ppm. ΣBHC levels in eggs fluctuated between 0.007 and 0.003 ppm. Dieldrin decreased in clams, carp and eggs from 0.003 in 1975 to 0.001 in 1979; milk levels fluctuated between 0.001 and 0.002 ppm. ΣDDT levels tended to decrease in eggs. In carp ΣDDT levels fluctuated between 0.007 and 0.005 ppm. In clams and milk ΣDDT levels were around 0.001 ppm.

81-0998. Inoue, T.; Konishi, T.; Yoneya, T. (Kyoto Prefect. Inst. Public Health & Environ., Kyoto, Kyoto, Japan) **[Residues of organochlorine pesticides in human blood.]** *Nippon Koshu Eisei Zasshi (Jpn. J. Public Health)* 27(10): 774; 1980 (Japanese).

Residue levels of the organochlorine pesticides α- and β-BHC, γ-BHC (lindane), *p,p'*-DDE and *p,p'*-DDT were measured in the blood of 19 men and 12 women from Kyoto Prefecture between ages 18 and 57. Residue levels were 0.1-0.4 ± 0.1 ppb for α-BHC, 0.1-6.5 ± 1.8 ppb for β-BHC, not detectable (nd)-2.5 ± 0.6 ppb for γ-BHC, 0.2-9.3 ± 1.7 ppb for *p,p'*-DDE, and nd-0.5 ± 0.1 ppb for *p,p'*-DDT. β-BHC showed the highest level among BHC isomers; however, this level (1979) was lower than that in blood of lactating women in Osaka Prefecture. The same tendency was observed with *p,p'*-DDE. A significant correlation (r + 0.44, probability 95%) was found between β-BHC and *p,p'*-DDE levels.

81-0999. Ishikawa, K.; Shinohara, R.; Yagi, A.; Shigematsu, S.; Kimura, I. (Life Sci. Res. Inst., Kumiai Chem. Ind., Shizuoka 439, Japan) **Identification of *S*-benzyl *N,N*-diethylthiocarbamate in paddy field soil applied with benthiocarb herbicide.** *Nippon Noyaku Gakkaishi (J. Pestic. Sci.)* 5(1): 107-109; 1980 (7 references).

A new degradation product of benthiocarb has been identified and linked with the phytotoxic action of benthiocarb toward rice plants. After dwarf rice plants grew in paddies treated with the herbicide benthiocarb, investigations were conducted for benthiocarb and its degradation products in different paddy soil samples. After separation of the residues by thin layer chromatography and subsequent gas chromatography of the benthiocarb TLC region, an unidentified peak was observed in samples from the paddy field where phytotoxicity had been observed. The compound was separated from benthiocarb and chromatographic and spectrometric analyses were performed to determine the compound structure. Evidence from these analyses suggested that the new compound was *S*-benzyl *N,N*-diethylthiocarbamate which is structurally similar to benthiocarb.

81-1000. Peterle, T. J. (Dep. Zool., Ohio State Univ., Columbus, OH) **Biological transfer and loss of ^{36}Cl-labeled DDT in an old-field ecosystem.** *OSU Rep.* COO-1358-16: 132 pp.; 1979 (17 references).

An enclosed 10-acre old-field plot treated in June 1969, with ^{36}Cl-labeled DDT was sampled each year from 1969 through 1974 to monitor the fate of the insecticide in the soil and biota. In order to provide data on compartmentalization of DDT in the vegetation, invertebrates and vertebrates inhabiting the plot, sampling was carried out to estimate both body burdens of DDT and biomass of populations. Another aspect of this study, the determination of rates of accumulation of residues by invertebrates and vertebrates, has been reported previously. This report describes the temporal patterns of DDT residues in soil and biota from 1969 through 1974 and the quantities of DDT held in the soil and biotic compartments of the ecosystem. (Author abstract by permission)

81-1001. Grau, B. L. (Dep. Zool., Ohio State Univ., Columbus, OH) **Translocation and accumulation of ^{14}C-DDT in an experimental old-field plot.** *OSU Rep.* COO-1358-16: 85 pp.; 1979 (95 references).

To determine the translocation and vaporization of ^{14}C-DDT, a 25 m^2 plot was treated with 1 lb/acre (1.13 kg/ha) granular ^{14}C-labeled DDT. Movement of the pesticide into surface run-off, ground water, and soil of an old-field ecosystem were also monitored. Samples were analyzed by liquid scintillation spectrometry. ^{14}C-DDT residues in air were highest 3 days post-application; background levels were reached by 29 days after application. Residues found in run-off were highest at 15 days after application and residue levels decreased to background levels within 1 mo. In ground water, no ^{14}C-DDT was detected at any depth sampled. ^{14}C-DDT residue levels were greater in the 0-3 cm soil layer than in the 3-6 cm soil layer by 1-2 orders of magnitude. Residues in the 3-6 cm soil layer were greater than background levels by similar amounts. It was concluded that the major sink for DDT was the soil; 91.8% of the applied DDT was located there.

81-1002. Ohlendorf, H. M.; Bartonek, J. C.; Divoky, G. J.; Klass, E. E.; Krynitsky, A. J. (Patuxent Wildl. Res. Cent., US Fish & Wildl. Serv., Laurel, MD 20811) **Organochlorine residues in eggs of Alaskan seabirds.** *Pac. Seabird Group Bull.* 6(2): 43; 1979.

Eggs of Alaskan seabirds were examined for 14 organochlorine compounds. DDE was the most frequently found contaminant; it was present in 100% of the eggs. The second most frequent contaminant were PCBs; found in 98.9% of the samples. Oxychlordane and HCB (hexachlorobenzene) were detected in 84.3 and 82.7%, respectively. Only one of the eggs taken from the 440 clutches contained endrin. All of the other chemicals investigated

occurred in at least 22% of the samples. Geographical and species differences were found to have a bearing on the particular contaminants present in the eggs. This finding reflects a non-uniform distribution of organochlorines in the environment and dissimilar feeding habits of the species.

81-1003. Moore, D. G.; Loper, B. R. (For. Sci. Lab., US For. Serv., Corvallis, OR 97331) **DDT residues in forest floors and soils of Western Oregon, September-November, 1966.** *Pestic. Monit. J.* 14(3): 77-85; 1980 (28 references).

Between 1945 and 1965, 1.82 million ha, or about 17% of the total commercial forestland in Oregon, were treated with 2.02 million kg DDT. Detectable residues of this insecticide might be present in forest soils, even those which have never received a direct application of insecticide. Forest floor and mineral soil samples were collected along 4 east-west transects across the Coast and Cascade Ranges. DDT residues were found in all samples, even though all but one site had never received a direct application of insecticide. In the Coast Ranges, mean concentrations of ΣDDT in forest floor samples were 0.049 ppm at the coast and 0.047, 0.064, 0.075, and 0.119 ppm at 16, 32, 48, and 64 km inland, respectively. Mean residue levels in the surface layers of mineral soil were much lower, 0.009 ppm and 0.006 ppm in the 0-7.5 cm and 7.5-15 cm depths, respectively. (Author abstract by permission)

81-1004. Fleming, W. J.; O'Shea, T. J. (Patuxent Wildl. Res. Cent., US Fish & Wildl. Serv., Laurel, MD 20811) **Influence of a local source of DDT pollution on statewide DDT residues in waterfowl wings, northern Alabama, 1978-79.** *Pestic. Monit. J.* 14(3): 86-89; 1980 (6 references).

Heavy DDT contamination resulting from a former DDT manufacturing plant in northern Alabama has influenced statewide averages of DDT, DDE, and TDE residues in duck wings tested in the National Pesticide Monitoring Program. In states where contaminant levels in duck wings are high, residue analysis of wings categorized by finer geographic subdivision may be useful in defining the areas of heaviest contamination. (Author abstract by permission)

81-1005. Klaas, E. E.; Ohlendorf, H. M.; Cromartie, E. (Iowa Coop. Wildl. Res. Unit, Iowa State Univ., Ames, IA 50011) **Organochlorine residues and shell thicknesses in eggs of the clapper rail, common gallinule, purple gallinule, and limpkin (class Aves), eastern and southern United States, 1972-74.** *Pestic. Monit. J.* 14(3): 90-94; 1980 (17 references).

Organochlorine residues and shell thicknesses were surveyed in eggs of the clapper rail (*Rallus longirostria*), purple gallinule (*Porphyrula martinica*), common gallinule (*Gallinula chloropas*), and limpkin (*Aramus guarauna*) from the eastern and southern United States. Clapper rail eggs were collected during 1972-73 in New Jersey, Virginia, and South Carolina. During 1973-74, gallinule eggs were collected in Florida, South Carolina, and Louisiana, and limpkin eggs were collected in Florida. Eggs contents were analyzed for residues of organochlorine pesticides, including DDT, TDE, DDE, dieldrin, mirex, heptachlor epoxide, oxychlordane, *cis*-chlordane (and/or *trans*-nonachlor), *cis*-nonachlor, hexachlorobenzene (HCB), toxaphene, and endrin, and for polychlorinated biphenyls (PCBs). Shell thicknesses of recent eggs of these species were compared with archival eggs that had been collected before 1947. With the exception of the limpkin, the majority of eggs analyzed contained residues of *p,p'*-DDE and PCBs. Geometric means ranged from 0.10 ppm to 1.3 ppm. Small amounts (< 1.0 ppm) of mirex, dieldrin, *cis*-chlordane (and/or *trans*-nonachlor), TDE, and DDT were detected in a few eggs. No evidence of eggshell thinning was found for any of the species studied. DDE residues in clapper rail eggs were higher in New Jersey and Virginia than in South Carolina. (Author abstract by permission)

81-1006. Hunter, R. G.; Carroll, J. H.; Randolph, J. C. (Environ. Anal. Sect., US Army Corps Eng., Tulsa, OK 74121) **Organochlorine residues in fish of Lake Texoma, October 1979.** *Pestic. Monit. J.* 14(3): 102-107; 1980 (8 references).

Fillets from 99 fish, representing 11 species and 3 areas within Lake Texoma, were examined for residues of common organochlorines. Statistical analyses were conducted to determine the relationship of residues in fish fillets to trophic level and to geographical location of the sample. Most species contained PCBs at levels up to 1100 ng/g and *p,p'*-DDE as high as 127 ng/g. *p,p'*-TDE and *o,p'*-DDT were not found in carnivores, but were present in herbivores and detritivores in amounts up to 36 ng *p,p'*-TDE/g and 17 ng *o,p'*-DDT/g. Heptachlor was also not found in carnivores, but was present as high as 37 ng/g in the other 2 classes. Chlordane ranged to 24 ng/g and was detected in all trophic levels. Dieldrin and *p,p'*-DDT were present in detritivores and carnivores up to 144 ng dieldrin/g and 410 ng *p,p'*-DDT/g. Neither substance was found in herbivores. Mirex, endrin, and heptachlor epoxide were present only at low levels. Statistically significant differences (P = 0.05) were found between trophic levels for 7 of the 11 organochlorine compounds. No correlation (P = 0.05) was found between fillet concentrations of any parameter and geographical location of the sample. (Author abstract by permission)

81-1007. Lindvall, M. L.; Low, J. B. (Parker River Natl. Wildl. Refuge, Plum Island, Newberryport, MA 01950) **Effects of DDE, TDE, and PCBs on shell thickness**

of western grebe eggs, Bear River Migratory Bird Refuge, Utah – 1973-1974. *Pestic. Monit. J.* 14(3): 108-111; 1980 (20 references).

DDE, TDE, and polychlorinated biphenyls (PCBs) as Aroclors 1260 and 1254 were detected in low concentrations in eggs of western grebes *(Aechmophorus occidentalis)* from Bear River Migratory Bird Refuge, Utah. DDE was the only contaminant which was both negatively correlated with eggshell thickness and a significant variable in a multiple regression model for predicting eggshell thickness. The eggshell thickness index for western grebe decreased 2.3% from pre- to post-DDT-use periods. Incubation stage appeared to have no measurable correlation with eggshell thickness. The small amount of eggshell thinning seen in western grebe eggs at Bear River Migratory Bird Refuge appeared to have no detectable effect on reproduction. (Author abstract by permission)

81-1008. Balasubramanya, R. H.; Patil, R. B. (Dep. Agric. Microbiol., Univ. Agric. Sci., Bangalore 560065, India) **Degradation of carboxin and oxycarboxin in different soils.** *Plant Soil* 57(2-3): 195-201; 1980 (19 references).

The metabolism of two systemic fungicides, carboxin and oxycarboxin, when applied to different types of soil, was studied. Carboxin underwent rapid degradation to its sulfoxide within 10 days in all 5 soils tested: red sandy loam soil, black clay soil, laterite soil, saline alkali soil, and coffee plantation soil. For both fungicides, aminophenol could be detected at the end of 8 mo in red sandy loam soil and after 6 mo in coffee plantation soil. In soils free of organic matter the fungicide degraded more quickly; only catalytic decomposition took place, with very little conversion of carboxin to its sulfoxide. Carboxin was rapidly converted to its sulfoxide form on all 3 clays, whereas oxycarboxin was transformed to an unidentified derivative. Hydrolysis of the fungicides in the presence of clay does not apparently occur. It is concluded that the adsorbed fungicides are protected from chemical or biological degradation in clay soils, thus allowing greater persistence.

81-1009. Schnoor, J. L. (Energy Div., Civil & Environ. Eng., Univ. Iowa, Iowa City, IA 52242) **Fate and transport of dieldrin in Coralville Reservoir: residues in fish and water following a pesticide ban.** *Science* 211(4484): 840-842; 1981 (11 references).

A model for the fate and transport of pesticide has been calibrated with field data from 1968 to 1978. The results have aided in a management decision to lift a commercial fishing ban in Coralville Reservoir, eastern Iowa. Dieldrin residues in fish, sediment, and water are all declining at about 15%/yr. Approximately 50% of the pesticide load is exported from the reservoir in the outflow, 40% undergoes sedimentation, and 10% enters the fish. (Author abstract by permission. Copyright 1981 by the American Association for the Advancement of Science)

81-1010. Loos, M. A.; Kontson, A.; Kearney, P. C. (Pestic. Degrad. Lab., Agric. Environ. Qual. Inst., Agric. Res., SEA, USDA, Beltsville, MD 20705) **Inexpensive soil flask for ^{14}C-pesticide degradation studies.** *Soil Biol. Biochem.* 12(6): 583-585; 1980 (17 references).

An inexpensive soil flask has been developed to overcome problems encountered with using biometer flasks to monitor the conversion of ^{14}C-labeled pesticides in soil to carbon dioxide. The soil flasks were tested by monitoring carbon dioxide produced from trichloroacetic acid (TCA), chlorpropham, 2,4-D, 2,4-D dimethylamine salt, cytosine sulfate, guanine hydrochloride, and urea. The initial applications of TCA and 2,4-D were degraded according to the enrichment pattern reported for perfused or amended soils. Chlorpropham was degraded according to the relatively slow, non-enrichment pattern shown in amended soils by bioassay. During these tests no maintenance or sampling problems were encountered.

81-1011. Aly, M. I.; Bakry, N.; Kishk, F.; El-Sabae, A. H. (Plant Prot. Dep., Fac. Agric., Univ. Alexandria, Alexandria, Egypt) **Carbaryl adsorption on calcium-bentonite and soils.** *Soil Sci. Soc. Am. J.* 44(6): 1213-1215; 1980 (11 references).

Adsorption of carbaryl on Ca-bentonite, and two Egyptian soils, a Nile alluvial and a highly calcareous soil, was carried out at different temperatures. Carbaryl adsorption increased as the temperature decreased. Ca-bentonite exhibited the highest degree of adsorption followed by the Nile alluvial soil and the calcareous soil. The calculated partial molar heat of adsorption ΔH^* for bentonite, alluvial and calcareous soils were −3.8, −0.924 and −10.282 kcal/mol, respectively, indicating that adsorption may be physical in nature. The ΔG^* values of the three systems were −0.570, −0.118 and −0.346 kcal/mol, respectively, indicating that the adsorption reaction was spontaneous in all cases. The adsorption data followed the Freundlich adsorption equation. The entropy values for the adsorption of carbaryl by the three adsorbents were −15.0, −36.7, and −8.0 entropy units indicating that carbaryl adsorption is favored by the alluvial soil that contains the highest organic matter content. (Author abstract by permission)

81-1012. Thomas, W.; Herrmann, R. (Author address not given) **Nachweis von Chlorpestiziden, PCB, PCA und Schwermetallen mittels epiphytischer Moose als Biofilter entlang eines Progils durch Mitteleuropa. [Detection of organochlorine pesticides, PCB, PCA, and heavy metals by means of epiphytic mosses as a biofilter along a profile across Central Europe.]** *Staub Reinhalt. Luft* 40(10): 440-444; 1980 (13 references) (German).

Organochlorine pesticides (*p,p'*-DDT, *o,p'*-DDT, α-BHC and lindane) were determined by gas chromatography in 37 samples of *Hypnum cupressiforme*

L. ssp. *filiforme* Brid. collected along an 800-km path in Central Europe from Berchtesgaden, West Germany to Ijmunden, The Netherlands. The minimum distance between the sampling site and roads was 250 m in all cases. High levels of all pesticides were found in areas of intensive agriculture and vegetable gardening, where use of large amounts of these pesticides occurs.

81-1013. Marcus, M.; Spigarelli, J.; Miller, H. (Midwest Res. Inst., Kansas City, MO 64110) **Organic compounds in organophosphorus pesticide manufacturing wastewaters.** *US NTIS PB Rep.* PB-289,821: 130 pp.; 1978 (9 references).

Preliminary survey information on the organophosphorus pesticide industry wastewater streams and analytical methods to monitor levels of organic compounds present in these streams are presented. The identification and quantification of organophosphorus compounds was emphasized, but non-phosphorus chemicals were also included in the survey. A secondary goal of the program was to use the survey information to evaluate the efficiency of various waste treatment processes. The wastewater from five pesticide plants that produced 8 organophosphorus pesticides was sampled, The pesticides were diazinon, methyl parathion, azinophos-methyl, disulfoton, fonofos, phosmet bensulfide, and EPN. The 116 compounds identified included organophosphorus pesticides, related organophosphorus esters, organophosphorus acids, volatile organic compounds, thiocarbamate pesticides, triazine herbicides, and miscellaneous extractable process chemicals, by-products, and compounds of unknown origin. (Author abstract by permission)

81-1014. Bryant, C. J.; Thoburn, T. W. (Health Hazard & Tech. Assist. Branch, NIOSH, Cincinnati, OH) **Health hazard evaluation determination. Report No. 78-113-589, Hopkins Agricultural Chemical Company, Atlanta, Illnois.** *US NTIS PB Rep.* PB80-199,284: 11 pp.; 1979 (4 references).

Breathing zone and general area samples for Counter 15-G (terbufos) insecticide, respirable particulates, total particulates, and respirable free silica were collected, and 21 employees were interviewed at the Hopkins Agricultural Chemical Company in Atlanta, IL, on January 9-11, 1979. An authorized employee representative requested the evaluation to assess toxic exposures of 10-20 employees. Gas chromatographic sample analysis revealed that all contaminants were below OSHA criteria for crystalline silica, and respirable and total particulates (10 mg/m³ divided by the % quartz + 2; 5 mg/m³; and 15 mg/m³, respectively). No standard exists for exposure to the insecticide, but measured concentrations were low (0.002-0.011 mg/m³). The authors conclude that no health hazard to workers existed at the time of the evaluation and recommend enclosure of local exhaust ventilation hoods, use of personal protective equipment to prevent oral and eye exposures, and continuation of a program of cholinesterase monitoring. (Author abstract by permission)

81-1015. Ketchledge, E. (New England Res. Appl., Cent., Storrs, CT) **Pesticide residues in foods. February, 1979-December, 1979.** *US NTIS PB Rep.* PB80-807,126: 167 pp.; 1980 (174 references).

These citations from the world food literature discuss the appearance of pesticides, or pesticide residues, in foods destined for human consumption. The foods discussed include fruits and vegetables, meats, dairy products, and seafoods. Pesticide levels, measurement methods, possible carcinogenicity and toxicity, and legislation on pesticide use, are also covered. (Author abstract by permission)

81-1016. Young, C. G. (New England Res. Appl., Cent., Storrs, CT) **The use of herbicides in food production. November, 1976-December, 1979.** *US NTIS PB Rep.* PB80-807,423: 182 pp.; 1980 (200 references).

The common use of chemical weed control, or herbicides, impacts the food industry in several ways: growth of the food plants is effected; the nutritional and vitamin content levels of the foods can be altered; the germination ability of the plant seeds is frequently changed; and most importaly, there are inevitable residues in the food product. Measurements of these residues, and tests of their effects on rats, are featured in the cited articles. (Author abstract by permission)

81-1017. Campanini, G.; Maggi, E.; Artioli, D. (Ist. Ispezione Aliment. Orig. Anim., Univ. Parma, Parma, Italy) **Present situation of organochlorine pesticide residues in food of animal origin in Italy.** *World Rev. Nutr. Diet.* 35: 129-171; 1981 (59 references).

The degree of organochlorine pesticide contamination in Italy is reviewed with emphasis on the residues of lindane, ΣBHC, heptachlor, heptachlor epoxide, aldrin, dieldrin, and the DDT group in milk, dairy products, beef, cooked beef products, pork, pork products, chicken, eggs, meat from other species, and fish and fish products. In no case were residues found in these products to the extent that concern should be expressed over the health of the consumers. It is suggested that monitoring of this pollution be continued until pesticide residues are negligible and those that have been banned in most countries are no longer used.

See also 81-0904, 81-0918, 81-0922, 81-0924, 81-0925, 81-0932, 81-0939, 81-0944, 81-0945, 81-1021, 81-1022, 81-1038, 81-1040, 81-1044, 81-1046, 81-1063, 81-1069, 81-1082, 81-1110, 81-1111, 81-1134, 81-1137, 81-1153, 81-1159, 81-1164, 81-1166, 81-1168, 81-1169, 81-1175 *and* 81-1180.

81-1018. Muller, H. R.; Secretin, M. C.; Blanc, E. (Nestle Prod. Tech. Assist. Co. Ltd., CH-1814 La Tour-de-Peliz, Switzerland) **New aspects in preventing contamination in the production of infant foods.** *Bibl. Nutr. Dieta* 29: 89-105; 1980 (17 references).

Methods for the prevention of contamination of infant foods are reviewed. The chronology of production of infant formula and the numerous controls imposed are described. Problems include the prevention of natural, chemical, or environmental pollution of food and raw materials, and prevention of contamination of the final product during processing. Man-made contaminants include pesticide residues, nitrites and nitrates. The overall ecological cycle for the appearance of pesticide residues in milk and meat is described. It is suggested that the best way to avoid contamination is the rough routine analysis of raw materials. Many countries are still without any legal ruling on pesticide contamination of infant foods; the reasons for this are discussed. The maximum for pesticide residues in infant food in Switzerland is given. The Swiss practical residue limits are 5 ppb for DDT and α-BHC, 2 ppb for aldrin/dieldrin and heptachlor, and 4 ppb for hexachlorobenzene.

81-1019. Meyer, F. P.; Schnick, R. A. (Natl. Fish. Res. Lab., US Fish & Wildl. Serv., La Crosse, WI 54601) **Potential problems in the registration of sea lamprey (*Petromyzon marinus*) control agents.** *Can. J. Fish. Aquat. Sci.* 37(11): 2093-2102; 1980 (36 references).

It is highly probable that increased data will be required in future applications for registration of control agents to support claims of efficacy, environmental safety, and human safety for control of the sea lamprey, *Petromyzon marinus*. Alternative techniques, such as biological or physical control methods, are also encompassed by regulatory control. Pheromones, hormones, attractants, and repellents are subject to the same stringent regulations applied to purely chemical methods. Guidelines for registering live biological control agents are under review and revision, but currently such agents are regulated under the same requirements as chemicals. The irreversible act of releasing living control organisms, such as predators, parasites, or pathogens, and their possible detrimental effects on nontarget species, will require significant proof that they will not harm the ecosystem. Biologics, such as serums, vaccines, or antigens, also require registration, but the process is less complicated and requires less time for completion. Regulation of physical control devices occurs only if the method or device is offered for sale with claims as to its efficacy. (Author abstract by permission)

81-1020. Brown, S. M. (Biom. Branch, NIEHS, Research Triangle Park, NC 27709) **Planning for studies in the epidemiology program.** *Environ. Health Perspect.* 33: 344; 1979.

Studies in the active planning phase of the Epidemiology Program of the Biometry Branch of NIEHS are presented. They include a case-control study of fetal deaths and malformations and chemical exposure; a case-control study of skin cancer and selenium, cadmium, copper, lead, zinc and arsenic; a series of studies of occupational exposure to radiation; an historical cohort study of the reproductive experience of perchlorethylene exposed dry cleaning workers; and an implementation study of the use of the laboratory for defining exposures and outcomes in epidemiologic studies.

81-1021. Sonstegard, R. A.; Leatherland, J. F. (Dep. Biol., McMaster Univ., Hamilton, Ontario, Canada) **Aquatic organism pathobiology as a sentinel system to monitor environmental carcinogens.** *Environ. Sci. Res.* 16: 513-520; 1980 (40 references).

A review of the carcinogenic hazards associated with drinking water and consumption of aquatic organisms is presented. Past epidemiological studies on the incidence of cancer and Mississippi River, Ohio River, and Lake Erie drinking water are outlined. Several other epidemiological studies have linked environmental factors to the incidence of cancer in man. Bioaccumulation of xenobiotics (such as mirex and other organochlorines) by aquatic organisms is detailed. The importance of these residue levels in assessing the hazards associated with human consumption of fish is stressed. New methods to evaluated environmental carcinogens, particularly *in vivo* and *in vitro* aquatic organisms testing, are suggested.

81-1022. Sidorenko, G. I.; Goncharuk, E. I.; Khovaka, V. V. (A. A. Bogomolets Med. Inst., Kiev, USSR) **Metodicheskie osobennosti izucheniya vliianiya zagriazneniya pochvy ekzogennymi khimicheskimi veshchestvami na zdorov'e naseleniya. [Methodologic aspects of studies into effects of soil pollution by exogenous substances on the health of the community.]** *Gig. Sanit.* 45(11): 5-7; 1980 (8 references) (Russian).

An attempt was made to evaluate the effects soil pesticides have on the health of rural populations. Two experimental regions treated predominantly with organochlorine pesticides were selected. Total pesticide levels were 12.67 kg/ha, compared to 1.29 kg/ha overall for the USSR. The level of pesticides application was correlated with morbidity and mortality parameters of children < 1-yr-old, all children, chronic infectious diseases, and chronic non-infectious diseases. Analysis of variance indicated that soil contamination levels had significant effects on the morbidity of children < 1-yr-old.

81-1023. Spynu, E. I.; Bolotnyi, A. V.; Zor'eva, T. D.; Ivanova, L. N. (Inst. Hyg. & Toxicol. Pestic. Polym. &

Plast., Kiev, USSR) **Printsipy obosnovaniya srokov bezopasnogo vykhoda liudei na ploshchadi, obratobannye pestitsidami. [Substantiation of timing of the start of work at fields treated with pesticides.]** *Gig. Sanit.* 45(11): 64-66; 1980 (3 references) (Russian).

A method for calculating a re-entry standard for work areas treated with pesticides is described. The calculations are based on the assumption that pesticides can enter workers not only via inhalation, but also dermally. These combined amounts of pesticides are then compared with the maximum permissible concentration. This approach was used to determine re-entry rates for a number of organochlorine [Kelthane (dicofol)] and organophosphorus [Rogor (dimethoate), Metaphos (methyl parathion), and Phthalophos (phosmet)] pesticides used in vineyards, orchards, and sugar beet fields. The re-entry periods for Phthalophos, Methylmercaptophos (demeton-O-methyl), and Intrathion (thiometon) are 7, 12, and 10 days, respectively.

81-1024. Zabulite, D. P.; Krasil'shchikov, D. G.; Vaitekunene, D. Yu.; Ramanauskene, V. V. (Res. Inst. Epidemiol. Microbiol. & Hyg., Vilnius, USSR) **K obosnovaniyu predel'no dopustimoi kontsentratsii iodofenfosa v vode vodoemov. [Substantiation of maximum permissible concentration of iodofenphos in bodies of water.]** *Gig. Sanit.* 45(11): 75-76; 1980 (Russian).

The maximum permissible concentration (MPC) of the organophosphorus insecticide iodofenphos (*O,O*-diethyl-*O*- (2,3-dichloro-4- iodophenyl)-thiophosphate) in bodies of water is reported. Iodofenphos was found to be relatively stable: 4 days after application at 0.5 mg/l, the level in water was decreased by only 49.2%, and complete degradation was recorded only 20 days after application. The olfactory perception threshold of iodofenphos was 1.9 mg/l. The threshold concentration with respect to nitrification effects was 50 mg/l. Chronic 10 mo exposures of random-bred albino rats showed that iodofenphos at 500 mg/l significantly increased activity of transaminases and inhibited activity of serum cholinesterase. Iodofenphos at 5 mg/l did not elicit these responses. It was concluded that the MPC should be assessed according to the organoleptic activity (1 mg/l).

81-1025. Vrochinskii, K. K.; Martson', V. S. (All-Union Res. Inst. Hyg. & Toxicol. Pestic. Polym. Plast., Kiev, USSR) **Obosnovanie predel'no dopustimoi kontsentratsii polikarbatsina v vode vodoemov. [Substantiation of maximum permissible concentration of polycarbazine in bodies of water.]** *Gig. Sanit.* 45(11): 76-77; 1980 (Russian).

To determine the maximum permissible concentration of the pesticide polycarbazine (zinc polyethylenthiuramdisulfide) in bodies of water, a series of toxicohygienic experiments were conducted. The olfactory threshold was at the level of 4.2 mg/l. On day 2-3 the olfactory threshold dropped to 2 mg/l. At 0.02-2.0 mg/l, polycarbazine did not affect the pH of the water. The LD50 after a single oral administration to rats was 6100 mg/kg. Mice were less sensitive. Clinical manifestations of acute poisoning with polycarbazine were similar to those after exposure to other dithiocarbamates. Chronic administration for 5-7 mo at 610, 305, 122, and 61 mg/kg did not cause the death of animals. At 30.5 mg/kg, polycarbazine reduced wt gain during the second half of the experiment, and caused a 10-15% decrease of the level of SH-groups in the blood. Polycarbazine at 7.6 mg/kg failed to produce any changes. Polycarbazine at 610 mg/kg had marked embryotoxic and teratogenic effects. It was recommended that the MPC should be based on the effect on the organoleptic properties of the water (2 mg/l).

81-1026. Anonymous **Chlorinated benzenes.** In: *Hazardous and Toxic Effects of Industrial Chemicals.* Sittig, M., ed. (Noyes Data Corp.: NJ): pp. 111-113; 1979 (6 references).

Chlorinated benzenes are aromatic rings with one or more chlorines substituted for a hydrogen. At room temperatures the compounds with only a few such substitutions are usually colorless liquids, while more highly substituted ones are crystals, usually monoclinic. Occupational exposure to chlorinated benzenes may occur through their use as solvents, dyes, fumigants, insecticides, chemical intermediates, disinfectants and moth preventatives. Federal law dictates exposure limits for chlorobenzene at 75 ppm, for *o*-dichlorobenzene at 50 ppm, and for *p*-dichlorobenzene at 75 ppm. These chemicals can enter the body through inhalation of vapors or dermal adsorption. Local effects include irritation to the skin, conjunctiva and mucous membranes of the upper respiratory tract, as well as skin burns. Systemic effects include drowsiness, incoordination and unconsciousness. Liver damage has resulted in animal experiments. Chronic exposure results in liver, kidney and lung damage. Periodic examinations of skin, liver, lung and kidney should be conducted among workers possibly exposed to chlorinated benzenes. Personal protection methods include the use of barrier creams, protective clothing and personal hygiene. Respirators may be used in areas of vapor concentration.

81-1027. Anonymous **Dibromochloropropane.** In: *Hazardous and Toxic Effects of Industrial Chemicals.* Sittig, M., ed. (Noyes Data Corp.: NJ): pp. 159-162; 1979 (1 reference).

Exposure to dibromochloropropane (DBCP) may occur through the use of this chemical as a nematocide. NIOSH recommendations state that no worker should be exposed to airborne DBCP at concentrations greater than 10 ppb for up to a 10-hr work shift, 40 hr/wk. The route of entry is inhalation of vapors. DBCP can cause sterility, diminished renal function, and degeneration and cirrhosis

of the liver. Gastric cancers were produced in mice through ingestion of daily doses. Mutagenic effects may also occur. Medical surveillance among possibly exposed workers should include semen analysis, measurements of hormone levels, and records of menstrual history. Personal protective procedures include the use of respirators, eye protection, protection clothing resistant to chemical penetration, gloves, overshoes, boots, air hoods or suits. All special equipment must be regularly examined for defects and maintained in a clean manner.

81-1028. Anonymous **1,2-Dibromoethane.** In: *Hazardous and Toxic Effects of Industrial Chemicals.* Sittig, M., ed. (Noyes Data Corp.: NJ): pp. 162-166; 1979 (20 references).

1,2-Dibromethane (ethylene dibromide) is used as a fumigant for ground pest control, resulting in possible exposure for farmers, cabbage growers, fumigant workers and termite controllers. The chemical has been measured in concentrations of 96 $\mu g/m^3$ up to a mile away from a USDA fumigation center. Ethylene dibromide degrades at moderate rates in both water and soil. Concentrations of 1 ppm have been found in streams of water on industrial sites. Residues of the substance may be present on disinfected fruits, vegetables, food grains, tobacco, seeds, seed beds, and in mills and warehouses. The federal exposure limit is 20 ppm for an 8 hr TWA with an acceptable ceiling concentration of 300 ppm. The chemical may be inhaled or absorbed through the skin. Local effects include erythema, blistering and skin ulcers. The vapor is an eye irritant and also harms the mucous membranes of the respiratory tract. Systemic effects include respiratory injury, central nervous system depression, vomiting, liver and kidney injury, and (in experimental animals) squamous cell carcinomas in the stomach. Some mutagenic activity has been reported. Medical surveillance testing should include periodic examinations of skin, eyes, respiratory tract, liver and kidney functions. Personal protection should include clothing with masks.

81-1029. Anonymous **Dinitro-*o*-cresol.** In: *Hazardous and Toxic Effects of Industrial Chemicals.* Sittig, M., ed. (Noyes Data Corp.: NJ): pp. 183-184; 1979 (4 references).

Dinitro-*o*-cresol (DNOC) is used in agriculture as an herbicide and pesticide. The federal exposure limit for all isomers is 0.2 mg/m^3. DNOC can enter the body through inhalation and percutaneous absorption. Local harmful effects are unknown, except for staining of skin and hair. Systemic effects included the blockage of the formation of high energy phosphate compounds. Early symptoms of toxicity include a rise in temperature accompanied by fatigue, sweating, unusual thirst and weight loss. Tachycardia and fever may lead to rapid deterioration and death. Medical surveillance tests should be include examination of the eyes, thyroid and cardiovascular system. Workers should be instructed in careful use of the skin and respiratory tract should provided by clothing and fullface masks with organic vapor canisters of air supplied respirators.

81-1030. Anonymous **Ethylene oxide.** In: *Hazardous and Toxic Effects of Industrial Chemicals.* Sittig, M., ed. (Noyes Data Corp.: NJ): pp. 208-210; 1979 (14 references).

Ethylene oxide has, among other uses, been employed as a fumigant for foodstuffs, and as an agricultural fungicide. Persons who might receive occupational exposure include exterminators, foodstuff fumigators, fumigant makers, fungicide workers and grain elevator workers. The federal exposure limit is 50 ppm. The gas enters the body through inhalation. Local harmful effects include skin irritation, allergic eczematous dermatitis, eye irritation and severe eye damage. Systemic effects include nausea, vomiting, irritation of the nose, throat and lungs, pulmonary edema, drowsiness and unconsciousness. Cancer has been produced in female mice exposed to ethylene oxide for long periods. Medical surveillance should include skin, eye, respiratory tract, blood, liver and kidney function tests. Personal protection may be enhanced through the use of eye and skin protective devices. Respirators should cover the face. Shoes contaminated by this chemical should be discarded.

81-1031. Anonymous **Ethylene thiourea.** In: *Hazardous and Toxic Effects of Industrial Chemicals.* Sittig, M., ed. (Noyes Data Corp.: NJ): pp. 210-214; 1979 (6 references).

Ethylene thiourea is present as a contaminant in the ethylene bisdithiocarbamate fungicides and can be formed when food containing these fungicides is cooked. While there is no current NIOSH suggested limit for exposure, it is advised that the level of exposure should be kept to a minimum. The chemical enters the body through inhalation of the dust. Ethylene thiourea has been shown to be carcinogenic and teratogenic in lab animals. It can also cause myxedema, goiter, and other effects related to decreases in the output of thyroid hormone. Personal protective methods include the substitution of an alternative material with a lower potential health hazard, enclosing the operation using ethylene thiourea, and the use of personal protective equipment including respirators.

81-1032. Annoymous **Hexachlorobenzene.** In: *Hazardous and Toxic Effects of Industrial Chemicals.* Sittig, M., ed. (Noyes Data Corp.: NJ): pp. 239-241; 1979 (11 references).

Hexachlorobenzene (perchlorobenzene; HCB) is considered. About 45,000 lb/yr (20,385 kg/yr) are released into the environment during pesticide use. The EPA has

established an interim tolerance of 0.5 ppm. Once toxicological data are made available, food tolerance levels will be set. HCB residues have been found in soil, wildlife, and food samples. Human adipose tissue samples have demonstrated that about 95% of the population of the US have HCB residues in their bodies. HCB has caused infant death and epidemics of skin sores and discolorations when accidentally ingested on contaminated seed grain. Enzyme disruptions noted in a small community in Louisiana in 1973 were attributed to HCB exposure. Teratogenic effects appear to be minimal in animal studies. A bioaccumulation factor of 15,000 had been demonstrated in catfish. Medical surveillance calls for regular medical examinations. Chemical safety goggles are recommended for eye protection, and respirators are needed to prevent inhalation.

81-1033. Anonymous **Kepone.** In: *Hazardous and Toxic Effects of Industrial Chemicals.* Sittig, M., ed. (Noyes Data Corp.: NJ): pp. 270-272; 1979 (1 reference).

Kepone (chlordecone) is discussed. The workplace environmental level for Kepone is limited to 1 $\mu g/m^3$ as a time-weighted average concentration for 10 hr/day, 40 hr/wk. Kepone enters the body through inhalation of the dust. Harmful effects noted among employees in a Kepone production plant in 1975 included tremors, visual disturbances, weight loss, nervousness, insomnia, chest pain, abdominal pain, infertility and loss of libido. Vertigo and lack of muscular coordination were sometimes present. Protective methods include the use of coveralls, or other full body protection including gloves, aprons and footwear, plus eye protection. All personal protective devices must be inspected regularly and maintained in clean working condition. Work clothing must remain at the plant.

81-1034. Anonymous **Malathion.** In: *Hazardous and Toxic Effects of Industrial Chemicals.* Sittig, M., ed. (Noyes Data Corp.: NJ): pp. 285-287; 1979 (1 reference).

Malathion is used to control insect pests on fruits, vegetables and ornamental plants. It has in the past been used to control houseflies, mosquitoes and lice, and on various farm and livestock animals. About 75,000 workers in the US are exposed to malathion during manufacture, formulation and application. Limits of exposure are 15 mg/m^3 of air for up to a 10-hr work shift at 40 hr/wk. Inhalation or skin exposure absorption are the routes of entry. Medical surveillance must include comprehensive medical examinations and alertness for symptoms such as headaches, dizziness, nausea, tightness of the chest, dimness of vision, and difficulty in focusing the eyes. Erythrocyte ChE activity must be monitored. Employees working with the material must wear full body covers, impervious gloves, footwear and goggles. Respiratory protection should not be needed under normal conditions.

81-1035. Anonymous **Methyl parathion.** In: *Hazardous and Toxic Effects of Industrial Chemicals.* Sittig, M., ed. (Noyes Data Corp.: NJ): pp. 305-307; 1979 (1 reference).

Methyl parathion is an organophosphorus insecticide which is converted in the body and in the environment to methyl paraoxon, a potent inactivator of acetylcholinesterase. Signs and symptoms of poisoning include nausea, vomiting, abdominal cramps, diarrhea, involuntary defecation and urination, blurring of vision, muscular twitching and difficulties in breathing. Personal protective measures include the use of special clothing and, in emergency situations, respirators. Stringent work practices and engineering controls must be followed by avoid skin contact or ingestion or inhalation of methyl parathion. The exposure limit is set at 0.2 mg/m^3.

81-1036. Anonymous **Parathion.** In: *Hazardous and Toxic Effects of Industrial Chemicals.* Sittig, M., ed. (Noyes Data Corp.: NJ): pp. 346-347; 1979 (1 reference).

Approximately 250,000 US workers are exposed to parathion. Limits of exposure are set at 0.05 mg/m^3 for a 10 hr work day, 40 hr/wk. Routes of entry include skin contact, ingestion or inhalation. Parathion is coverted to paraoxon, a potent inactivator of acetylcholinesterase. Symptoms of poisoning include nausea, vomiting, abdominal cramps, diarrhea, involuntary defecation and urination, blurred vision, muscle twitching and difficult breathing. Personal protective equipment includes protective clothing and, in emergency situations, the use of respirators.

81-1037. Anonymous **Tetramethylthiuram disulfide.** In: *Hazardous and Toxic Effects of Industrial Chemicals.* Sittig, M., ed. (Noyes Data Corp.: NJ): pp. 405-406; 1979 (2 references).

Tetramethylthiuram disulfide (thiram) is used as a seed, nut, fruit, and mushroom disinfectant, a fungicide and a rodent repellent. The at risk population consists of production workers. Federal standards for thiram exposure are 5 mg/m^3. Route of entry includes the inhalation of dust, spray or mist. Local harmful effects include irritation of mucous membranes, conjunctivitis, rhinitis, sneeze and cough. Systemic effects include bronchitis, rapid pulse, dizziness and hypotension. Medical surveillance should include examinations of skin allergies, eye injury, respiratory, liver or kidney disease. Skin and eye protection should be provided using clothing, gloves and goggles. Showers should be enforced following each shift. Respiratory protection may be offered in areas where dust, spray or mist are excessive.

81-1038. Baumann, K.; Angerer, J.; Heinrich, R.; Lehnert, G. (Ordinariat Arbeitsmed., Univ. Hamburg, D-

2000 Hamburg 76, BRD) **Occupational exposure to hexachlorocyclohexane. I. Body burden of HCH-isomers.** *Int. Arch. Occup. Environ. Health* 47(2): 119-127; 1980 (22 references).

Fifty-seven workers involved in the production of γ-hexachlorocyclohexane (γ-HCH; γ-BHC; lindane) for 1-30 yr (mean 10 ± 9 yr) were examined with regard to the HCH isomer content in blood. Blood samples were drawn at the end of the working week, and concentrations of HCH isomers in serum were determined by gas chromatography. Samples of subcutaneous adipose tissue were taken from the lower left abdomen of 13 volunteers and analyzed for HCH isomers. The control group consisted of 20 workers with no occupational HCH contact. Analysis of air samples in the work areas showed that the TLV-TWA of 0.5 mg/m/³ was not exceeded. The control group showed no HCH concentrations in serum above the detection limits, but the exposed workers showed serum values in the following ranges: (α-HCH: 10-273 μg/l, β-HCH: 17-760 μg/l, and γ-HCH: 5-188 μg/l). A significant increase in γ-HCH concentration was seen with increase in time of employment in lindane production. In addition, concentration of β-HCH in subcutaneous adipose tissue was about 300-fold higher than in serum. This evidence for accumulation in humans suggests that adherence to the TLV-TWA is not sufficient for control of HCH exposure, and biological monitoring of exposed persons is indicated.

81-1039. Leroith, D.; Potashnik, G.; Dunn, J.; Spitz, I. M. (Dep. Med., Soroka Med. Cent., Fac. Health Sci., Ben-Gurion Univ. Negev, Beersheva, Israel) **The exaggerated prolactin response to thyrotropin-releasing hormone and metoclopramide in 1,2-dibromo-3-chloropropane-induced azoospermia.** *J. Clin. Endocrinol. Metab.* 52(1): 38-41; 1981 (17 references).

Twelve male subjects who developed azoospermia following exposure to the nematocide 1,2-dibromo-3-chloropropane (DBCP) were studied in an attempt to elucidate the mechanism for the condition. DBCP reportedly produces selective atrophy of the germinal epithelium, which was confirmed by testicular biopsy in these subjects. Two to 5 yr after the last DBCP exposure, subjects were given 100 μg LRH, 200 μg thyrotropin-releasing hormone (TRH), and 10 mg metoclopramide (MET) iv at 30 min intervals. Blood samples were drawn at 10 min intervals and analyzed for serum LH, FSH, prolactin (PRL), 17β-estradiol (E_2), testosterone (T), T-binding globulin (TeBG), and free T levels. When results were compared with 24 male controls, it was seen that the exposed subjects showed increases in basal FSH and LH levels, peak gonadotropin response to LRH, and total E_2, T, and TeBG levels. There was no significant difference in free T levels. Basal PRL response levels were similar, but the peak PRL responses to TRH and MET were significantly increased in exposed subjects. A correlation was found between TeBG levels and the PRL response to TRH and MET. It is suggested that the PRL hyper-responsiveness may be an estrogen-induced phenomenon.

81-1040. Kukunbaev, R. U. (Dep. Ind. Hyg., Med. Inst., Tashkent, USSR) **Tsitogeneticheskii analiz perifericheskoi krovi rabotaiushchikh s gerbitsidom Kotoran. [Cytogenetic analysis of peripheral blood in workers exposed to the herbicide Cotoran.]** *Med. Zh. Uzb.* (10): 65-67; 1980 (10 references) (Russian).

Cytogenetic analysis of peripheral blood leukocytes was conducted in 44 clinically healthy agricultural workers prior to, immediately after, and on day 40 after termination of application of the herbicide Cotoran (fluometuron). The concentration of Cotoran in the air of the working zone was 4.28-10.98 mg/m³ for the sowers and 0.64-7.4 mg/m³ for the tractor drivers (MPC for Cotoran is 5.0 mg/m³). Immediately after termination of Cotoran application, the frequency of aberrant metaphases in sowers and tractor drivers was 5.8% and 4.3%, respectively, compared with 2.5% prior to the exposure. On day 40 after exposure, the frequency of aberrant cells was 3.01% and 3.29%, respectively.

81-1041. Chandratre, M. T.; Gupta, V. P. (Maharashtra State Dep. Agric., Pune, India) **Insecticides Act, its enforcement and implementation in Maharashtra.** *Pesticides* 14(9): 3-7; 1980 (4 references).

The Indian Government Insecticides Act of 1968 requires any person desiring to manufacture, sell, stock or exhibit for sale, or distribute insecticides to apply for a license through the Department of Agriculture. State governments legislate provisions to enforce the act, and licenses cannot be granted unless adequate and proper storage facilities are available. Inspections of small and medium scale pesticide formulation plants have shown poor implementation of these safety and health provisions which promote a healthy work environment for workers. Recommendations are made for improving this situation.

81-1042. Sittig, M., ed. (Author address not given) **Landfill disposal of hazardous wastes and sludges. 1979.** *Pollut. Technol. Rev.* 62: 369 pp.; 1979 (29 references).

Landfill technology and directions for the disposal of unwanted hazardous and toxic substances are discussed. Specific topics considered include waste sources such as chemicals and sewage sludge; waste disposal alternatives, including landfill, landspreading, composting, incineration, pyrolysis, ocean dumping and deep well disposal; local state and federal regulatory requirements; waste preparation; and public relations and public participation. Site selection considerations include soil type, surface water, vegetation, access, land use and zoning, and cost estimates as well as design constraints; construction and

operation of landfill areas; monitoring; landfill application to specific industry wastes, economic aspects; and final land use.

81-1043. Comm. Toxicol., NRC, Washington, DC **Review of U.S. Air Force protocol: epidemiological investigation of health effects in Air Force personnel following exposure to Herbicide Orange.** *US NTIS AD Rep.* AD-A085,105: 25 pp.; 1980.

The stated purpose of the proposed Air Force study is to determine whether long-term health effects exist and can be attributed to occupational exposure to Herbicide Orange (2,4-D + 2,4,5-T). To accomplish this, the investigators developed three independent study goals: health goals to identify veteran or active duty Air Force personnel who manifest adverse health effects attributable to herbicide exposure or who are at risk of developing future adverse health effects; political goals to satisfy the social concern for proper investigation voiced by lay and scientific communities; and legal goals to clarify the question of compensation awards to the Veterans Administration (VA) claimants. The Air Force proposes a complex study design consisting of a retrospective cohort mortality study, a questionnaire and physical examination study of morbidity in Air Force personnel, and a 5-yr prospective follow-up study of participants in the morbidity component. A critique of the study, the statistical power of the study, the health indices selected, and the credibility factors involved in the study are outlined. (Author abstract by permission)

81-1044. Nigg, H. N. (Agric. Res. & Educ. Cent., Lake Alfred, FL) **Worker reentry in Florida. Citrus pesticides in the agricultural environment.** *US NTIS PB Rep.* PB80-177,728: 66 pp.; 1980 (49 references).

The environmental behavior of five organophosphate insecticides in Florida citrus are reported. The parathion disappearance rate from fruit, leaf, and soil surfaces was the same. Potential worker exposure to parathion was from leaf surface, soil surface, fruit surface, and a minor component in air. Disappearance of parathion surface residues was accurately represented with a first-order solar radiation, rainfall, temperature, and dew model. Dialifor, malathion, oxydemeton-methyl, and dioxathion fruit and leaf surface residues exhibited different disappearance rates. The disappearance rate, however, was the same on fruit and leaf surfaces for the individual compounds. Based on rates of disappearance under different environmental conditions, environmental sensitivity was oxydemeton-methyl > malathion > dioxathion > dialifor. These data suggest that fruit data could be eliminated from worker safety reentry registration requirements for organophosphate insecticides. Two surface residue techniques were compared. Vacuum and dislodgeable residue techniques differed in the amount of particulate matter and pesticide residue recovered. Vacuum, dislodgeable and air particulate numbers and sizes were relatively comparable. The dislodgeable residue technique for worker reentry data appeared to be superior to the vacuum technique. (Author abstract by permission)

81-1045. Bealock, C. R.; Shaughnessy, J. A.; Johnson, D. E.; Caswell, R. L. (Off. Pestic. Programs, US EPA, Washington, DC) ***Acceptable Common Names and Chemical Names for the Ingredient Statement on Pesticide Labels.*** *US NTIS PB Rep.* PB80-182,660: 256 pp.; 1979 (12 references).

This current edition is a revision and extension of the third edition of *Acceptable Common Names and Chemical Names for the Ingredient Statement on Pesticide Labels.* The main purpose, for reviewers and registrants as before, is the naming of pesticides on label ingredient statements. If both common and chemical names are given an entry number (accession number), then both are required on the label. Almost all of the listed names are active ingredients; however, some may now be obsolete and others not yet registered. (Author abstract by permission)

81-1046. Todd, A. S.; Timbie, C. Y. (Stewart-Todd Assoc. Inc., Wayne, PA) **Industrial hygiene report: preliminary survey of wood preservative treatment facility at Permapost Products Company, Hillsboro, Oregon.** *US NTIS PB Rep.* PB80-186,661: 21 pp.; 1979.

The Permapost Products Company of Hillsboro, OR, was surveyed on June 25, 1979, to provide information on current and past process methods and materials used for treating wood products, to review occupational safety and health procedures, determine exposure concentrations of pentachlorophenol (PCP), and collect information for future technical reports. Twenty employees were involved in the wood preserving processes which include treatment by copper-8-quinolinolate, chromated copper arsenate (CCA) and PCP. The company had no formalized medical monitoring or industrial hygiene programs although annual audiometric tests were given and exposure was controlled through work practices, processing methods, and protective equipment. Both the NIOSH and silica gel methods for air monitoring revealed that airborne PCP concentrations were below the limit of detection inside the treatment building. Samples taken on top of the hot wood bundles removed from the treatment cylinder indicated that PCP concentrations were below 0.26 mg/m³. Samples taken at a site near the cylinder when its door was opened indicated PCP concentrations of 0.51 mg/m³ by the NIOSH method and 0.20 mg/m³ by the silica gel method. The authors conclude that a comparative evaluation of the two monitoring methods cannot be made due to the small number of samples taken, and that 3 of the 6 samples had concentrations below detection limits. (Author abstract by permission)

81-1047. Special Pestic. Review Div., US EPA, Arlington, VA **2,4,5-T: Position document 1.** *US NTIS PB Rep.* PB80-212,665: 150 pp.; 1979 (179 references).

The report is a preliminary risk assessment for 2,4,5-T herbicides. It gives a preliminary examination of its use, environmental residues, and health effects including toxicology data. Limited information is provided for exposure and extent of risk. Results of a literature search are provided. (Author abstract by permission)

81-1048. Conso, F. (Poison Control Cent. Paris, F-75010 Paris, France) **Paraquat poisoning: experience of poison control centers in France.** *Vet. Hum. Toxicol.* 21(SPPL): 112-113; 1979.

Seventy cases of paraquat poisoning were reported to poison control centers in France from 1973-1977. Contamination from occupational exposure was reported in 17 cases. Paraquat was ingested either accidentally or intentionally in 47 cases. In the 24 lethal cases, the chemical was ingested. Of the 25 accidental ingestion cases, 7 resulted in death, whereas 17 of 22 suicide attempts were fatal. Clinical findings included transient dyspnea, digestive symptoms such as epigastric pain and vomiting, plus skin irritation. Epistaxis was not found in these patients. Ocular contamination with the dilute product caused acute inflammation but no lasting damage to the cornea. Those patients suffering from skin exposure experienced none of the general symptoms due to the low percutaneous absorption of paraquat. [Presented at the joint annu. mtg. of the Eur. Poison Control Cent. and Int. Assoc. Forens. Toxicol.]

81-1049. Howard, J. K. (Jealott's Hill Res. Stn., Plant Prot. Div., Imp. Chem. Ind. Ltd, Bracknell, Berkshire, England) **Recent experience with paraquat poisoning in Great Britain - a review of 68 cases.** *Vet. Hum. Toxicol.* 21(SPPL): 213-216; 1979 (8 references).

Experience in the treatment of 68 cases of intentional paraquat poisoning which occurred in England during 1977 is reviewed. Treatment included Fullers earth and saline purgatives. The overall mortality was 60.3% (41 of 68 cases). Liquid concentrate formulations caused greater mortality than the granular formulations. This was due to the fact that larger quantities were usually taken when the liquid form was used. None of those ingesting more than 6 g paraquat ion survived. Four fatal cases following ingestion of liquid concentrate showed no evidence of either renal, hepatic or pulmonary damage; all died within 24 hr due to circulatory collapse. The normal pattern was renal failure followed by lung damage. Renal damage in many cases was severe. Central nervous system involvement was observed in 2 cases and another 2 cases showed methemoglobinemia. Two died from inhalation of Fuller's earth and 3 died from myocardial infarction during therapy. [Presented at the joint annu. mtg. of the Eur. Poison Control Cent. and Int. Assoc. Forens. Toxicol.]

See also 81-0904, 81-0927, 81-0931, 81-0932, 81-0946, 81-0949, 81-0959, 81-0969, 81-0972, 81-0974, 81-0981, 81-1013, 81-1014, 81-1015, 81-1060, 81-1076, 81-1098 *and* 81-1166.

81-1050. Lundholm, C. E. (Dep. Pharmacol., Linkoping Univ., S-58185 Linkoping, Sweden) **Comparison of *p,p'*-DDE and *o,p'*-DDE on eggshell thickness and Ca binding activity of shell gland in ducks.** *Acta Pharmacol. Toxicol.* 47(5): 377-384; 1980 (32 references).

That DDE concentrations that cause eggshell thinning *in vivo* might also influence calcium binding capacity of shell gland homogenates *in vitro* was investigated. One-yr-old ducks were given 40 mg/kg *p,p'*-DDE in their diet for 45 days. Significant and long lasting reductions in shell thickness were observed. Indian Runner Ducks demonstrated more significant thinning than did Swedish Rouen ducks. Residues of *p,p'*-DDE in each species were similar. Calcium binding to eggshell homogenates was found to be dependent on the presence of ATP. The addition of NaN_3 inhibited calcium binding by about 50%. The presence of *p,p'*-DDE or *o,o'*-DDE in the incubation medium reduced calcium binding in a similar and dose-dependent manner.

81-1051. Svobodova, Z. (Ichthyol. & Hydrobiol. Res. Inst., Vodnany, Czechoslovakia) **Akutini toxicita pesticidu pro ryby. [Acute toxicity of pesticides to fish.]** *Agrochemia* 20(11): 328-332; 1980 (17 references) (Czech).

Acute toxic effects (48-hr LC50) of organophosphorus pesticides (I), carbamates (II), phenoxyacetic acids (III), triazines (IV) and ethylene diamino copper sulfate (V) on common carp, rainbow trout and minnows were tabulated on the basis of experimental results. Clinical and histopathological findings, as well as hematological and biochemical changes found, are described. Overall, type I pesticides were rated toxic to highly toxic. Type II pesticide toxicity, due to acetylcholine hydrolase inhibition, was only temporary with non-specific symptoms. The most frequently used type III pesticides were mildly toxic or toxic to fish. Type IV pesticides were found to be toxic to highly toxic with symptoms similar to type III. The widely used type V fungicides, bactericides and algicides were found to be highly toxic, inducing fast respiration with toxicity characteristics similar to types III and IV.

81-1052. Nair, K. K.; Bartels, P. H.; Mahon, D. C.; Olson, G. D.; Oloffs, P. C. (Dep. Biol. Sci., Simon Fraser Univ., Burnaby, British Columbia V5A 1S6, Canada) **Image analysis of hepatocyte nuclei from chlordane-treated rats.** *Anal. Quant. Cytol.* 2(4): 285-289; 1980 (11 references).

The effects of chlordane on hepatocyte nuclei are examined by image analysis after rats were exposed to various regimens of carbon tetrachloride vapors + chlordane (0.1 mg/kg/day). After 20 wk liver tissues were processed for Feulgen microspectrometry with a Zeiss Scanning Microscope Photometer. Only a small proportion (3.5%) of controls showed a ploidy of 16c, twice the normal DNA content. A statistically significant increase in the percentage of 16c nuclei was observed in three experimental groups: those receiving CCl_4 for 10 wk and no chlordane; those receiving CCl_4 + chlordane for 10 wk and then chlordane alone for 10 wk; and those receiving CCl_4 for 10 wk and then chlordane for 10 wk. Additionally, cells with unaltered DNA content underwent statistically significant changes in their chromatin distribution pattern. These image analysis techniques can detect toxic effects not apparent by visual inspection.

81-1053. Rieger, K. (Inst. Mikrobiol. Wasser & Abfalltechnol., Techn. Univ. Graz., Graz, Austria) **Vergleichend toxikologische Untersuchungen mit verschiedenen Fischarten. [Comparative toxicological investigations with several fish species.]** *Arch. Fischereiwiss.* 30(1): 75-80; 1980 (4 references) (German).

The toxicity of detergents and of the algicide Dimanin A (benzalkonium chloride; DA) was studied in carp *(Cyprinus carpio)*, guppy *(Lebistes reticulatus)*, and zebrafish *(Brachydanio rerio)* at oxygen saturation and at an oxygen concentration of 5-6 mg/l. The toxicity was determined from the survival time (in min) at the different concentrations. At oxygen saturation, the survival times were 15 min for carp, 19 min for guppy, and 14 min for zebrafish at the highest DA concentration tested (500 mg/l). The survival times weree 609 min for carp, 1860 min for guppy, and 420 min for zebrafish at the lowest lethal concentration (15 mg/l). All fish survived at 10 mg/l. At an oxygen concentration of 5-6 mg/l, the mean survival times for carp, guppy, and zebrafish were 15, 11, and 10 min, respectively, at 500 mg/l and 203, 1100, and 282 min, respectively, at 15 mg/l. While the guppies survived at 10 mg/l, carp and zebrafish died in 660 and 482 min, respectively. All fish survived at 5 mg/l.

81-1054. Cambon, C.; Declume, C.; Derache, R. (Unite U-87, INSERM, Univ. Paul Sabatier, F-31400 Toulouse, France) **Fetal and maternal rat brain acetylcholinesterase: isoenzyme changes following insecticidal carbamate derivatives poisoning.** *Arch. Toxicol.* 45(4): 257-262; 1980 (16 references).

Pregnant rats (18th day) were orally given insecticidal carbamates with anticholinesterasic properties: 50 mg/kg carbaryl, 0.1 mg/kg aldicarb, 2.5 mg/kg carbofuran and 20 mg/kg pirimicarb. The acetylcholinesterase (AChE) isoenzymes from the brain of mothers and their fetuses were separated by electrophoresis on polyacrylamide gel. The 4 carbamate derivatives caused a significant lowering of the percentage of the least mobile isoenzyme (isoenzyme 1) in mother. Aldicarb, carbaryl and pirimicarb also caused a significant decrease in the percentage of the first fetal isoenzyme. The second fetal isoenzyme underwent a decrease after treatment with aldicarb or carbofuran. The distribution of the fetal isoenzymes was

seen to be different to that of the dams in both control and treated animals. The difference in sensitivity of the cerebral AChE to the insecticides under investigation is thought to depend on differences of the fixation of carbamate derivatives on the fetal and maternal isoenzymes. (Author abstract by permission)

81-1055. Lotti, M.; Johnson, M. K.* (MRC Toxicol. Unit, Carshalton, Surrey SM5 4EF, England) **Repeated small doses of a neurotoxic organophosphate. Monitoring of neurotoxic esterase in brain and spinal cord.** *Arch. Toxicol.* 45(4): 263-271; 1980 (18 references).

The effects of small repeated oral doses of mono-2-cresyl diphenyl phosphate (MOCP, 2.5 mg/kg/day) on hen brain and spinal cord neurotoxic esterase (NTE) were measured. The enzyme levels were depressed to about 40% and 55% of normal, respectively, and maintained at that level for 8 wk. No clinical and only doubtful histological signs of neuropathy were detected. Neuropathy could be precipitated by depressing the level to < 20% either with a single high dose (50 mg/kg), or by an increase of the repeated dose level to 5 mg/kg/day. There was no correlation between inhibition of NTE in the nervous tissue and the NTE-like activity in lymphocytes. NTE-like activity in spleen was consistently inhibited but to a lesser extent than that in the brain or spinal cord. Brain AChE and BuChE were not affected. (Author abstract by permission)

81-1056. Verschoyle, R. D.; Aldridge, W. N.* (Dep. Pharmacol. & Toxicol., Sch. Med., Univ. Trondheim, Reg. Hosp., N-7000 Trondheim, Norway) **Structure-activity relationships of some pyrethroids in rats.** *Arch. Toxicol.* 45(4): 325-329; 1980 (12 references)

The intravenous toxicity to the rat of 36 pyrethroids has been examined. With 2 exceptions they caused either T-syndrome, consisting of aggressive sparring, sensitivity to external stimuli, fine progressing to gross whole body tremor, and prostration of CS-syndrome, consisting of pawing and burrowing behavior, salivation, coarse tremor, progressing to sinuous writhing (choreoathetosis) and clonic seizures. The two exceptions presented a TS-syndrome with salivation associated with the T-syndrome. No clearcut relationship between chemical structure and symptoms of poisoning has emerged though some generalizations are discussed. (Author abstract by permission)

81-1057. Okonek, S.; Reininghaus, I.; Setyadharma, H.; Gaudron, P. (Zent. Entgiftung & Giftinformation, Med. Klin. II & Poliklin, Univ. Mainz, D-6500 Mainz, BRD) **An economical hemoperfusion system to determine *in vitro* clearances of various poisons with different adsorbents.** *Arch. Toxicol.* 46(3-4): 215-220; 1980 (5 references).

An economical hemoperfusion system for clearance studies *in vitro* was developed. It was ascertained that hemoperfusion using columns which contain 13 g of adsorbent and are perfused at a blood flow rate of 1.25 ml/min results in the same relative clearances as when using clinical sized columns containing 300-355 g of the adsorbent and run at 100 ml/min. The adsorption kinetics of toxicologically important drugs and pesticides are given as examples. To date 27 substances were tested systematically. The investigation has shown that no adsorbent is without exception the best one, but the efficacy can very from substance to substance. (Author abstract by permission)

81-1058. Reznik, G.; Stinson, S. F.; Ward, J. M. (Tumor Pathol. Branch, Carcinog. Test. Program, NCI, Bethesda, MD 20205) **Respiratory pathology in rats and mice after inhalation of 1,2-dibromo-3-chloropropane or 1,2-dibromoethane for 13 weeks.** *Arch. Toxicol.* 46(3-4): 233-240; 1980 (12 references).

Seventy F344 rats and 144 B6C3F1 mice were subdivided into 7 groups. Three groups were each exposed via inhalation to 1, 5, or 25 ppm of 1,2-dibromo-3-chloropropane (DBCP) for 6 hr/day, 5 days/wk for 13 wk. Three additional groups were each similarly exposed to 3, 15, or 75 ppm of 1,2-dibromoethane (EDB; ethylene dibromide). The remaining group was exposed to room air under the same conditions. At 13 wk, rats and mice showed severe necrosis and atrophy of the olfactory epithelium in the nasal cavity after inhalation of 5 or 25 ppm DBCP and 75 ppm EDB. Lower concentrations induced squamous cell metaplasia, hyperplasia and cytomegaly of the epithelium of the respiratory nasal turbinals. Squamous metaplasia, hyperplasia and cytomegaly of the epithelium was also seen in larynx, trachea, bronchi and bronchioles. Other compound related toxic lesions in rats were seen in the liver, kidney and testes. (Author abstract by permission)

81-1059. Hemminki, K.; Falck, K.; Vainio, H. (Dep. Ind. Hyg. & Toxicol., Inst. Occup. Health, SF-00290 Helsinki 29, Finland) **Comparison of alkylation rates and mutagenicity of directly acting industrial and laboratory chemicals. Epoxides, glycidyl ethers, methylating and ethylating agents, halogenated hydrocarbons, hydrazine derivatives, aldehydes, thiuram and dithiocarbamate derivatives.** *Arch. Toxicol.* 46(3-4): 277-285; 1980 (26 references).

Groups of industrial and laboratory chemicals were tested for their alkylation activity using 4-(p-nitrobenzyl)-pyridine and deoxyguanosine as nucleophiles. The alkylation activity was compared with mutagenicity of the chemicals to *E. coli* WP2 uvrA without metabolic activation. All the epoxide-containing compounds, including simple epoxides and glycidyl ethers, elicited alkylation ac-

tivity and mutagenicity. Furthermore there was a reasonable correlation between the rate of alkylation and the mutagenic potency. All the methylating and ethylating compounds tested were active but no correlation was observed between the rate of alkylation and the mutagenic potency, apparently due to the different types of alkylation products formed. The other compounds tested including halogenated hydrocarbons, hydrazine derivatives, aldehydes, thiram and dithiocarbamate derivatives elicited a slow or no alkylation activity while many of the compounds were mutagenic. There was no evidence among the chemicals tested of an alkylating non-mutagen. Thus evidence of alkylation activity appears to indicate mutagenic risk. (Author abstract by permission)

81-1060. Bedo, M.; Cieleszky, V. (Dep. Pathophysiol. & Toxicol. Chem., Inst. Nutr., Budapest, Hungary) **Nutritional toxicology in the evaluation of pesticides.** *Bibl. Nutr. Dieta* 29: 20-31; 1980 (24 references).

A discussion of the role of nutritional toxicology in pesticide evaluation is presented. Quantifiable methods for measuring and expressing toxicity are needed for safety assessment. Lethality as an index of safety is inadequate. Coordination between agricultural, chemical and medical experts is required to determine acceptable daily allowable limits to replace lethality as an index. The use of animal studies is described. Studies on the pesticide Lannate (methomyl) are presented. Single (up to 800 ppm) oral dosing of this pesticide to rats caused no brain ChE activity changes and no alterations in total lipid or cholesterol levels, or liver protein content. Growth, enzyme levels and hexobarbitol sleeping time were not affected by chronic exposure to 100 and 200 ppm Lannate in the food of experimental rats, but ChE activity decreased in female rats. Studies were conducted on the interrelationship between Lannate, ethanol and caffeine. The pesticide acted synergistically with the compounds to increase kidney wt, and elevate triglyceride and FFA levels.

81-1061. Paulov, S. (Dep. Gen. Zool. & Anim. Physiol., Fac. Nat. Sci., CS-886-04 Bratislava, Czechoslovakia) **Ucinnost herbicidu dinoseb-acetatu (Aretit) na zivotaschopnost a telove bielkovinky ryb (*Poecilia reticulata*). [Influence of the herbicide dinoseb acetate (Aritit) on viability and proteins of the fish (*Poecilia reticulata*).]** *Biologia (Bratislava)* 35(11): 827-830; 1980 (15 references) (Czech).

The effects of dinoseb-acetate on fish muscle protein were investigated. Levels of extracted protein and viability of protein in muscles of *Poecilia reticulata* were determined after the fish were exposed to various levels of the herbicide. Fish were sensitive to all levels of the herbicide tested. Complete mortality occurred at concentrations greater than 0.8 mg/l. Qualitative changes in muscle proteograms were determined by electrophoresis.

81-1062. Tomasovicova, D.; Toth, D. (Dep. Exp. Biol. & Ecol., Slovak Acad. Sci., Bratislava, Czechoslovakia) **Vplyv fungicodov na laktatdehydrogenazu a malatdehydrogenazu *Escherichia coli*. [Notes on the influence of fungicides on lactate dehydrogenase and malate dehydrogenase of *Escherichia coli*.]** *Biologia (Bratislava)* 35(12): 919-926; 1980 (11 references) (Czech).

Cell-free homogenized extracts of *Escherichia coli* were used to evaluate the effects of various fungicides on lactate dehydrogenase (LDH) and malate dehydrogenase (MDH) activities. The fungicides studied were Dithane, M-45 (mancozeb), *ortho*-Phaltan (folpet), Sulikol (colloidal sulfur), Benlat (benomyl), and Topsin (thiophanate). Except for Topsin, all fungicides interfered with the metabolism of Danube River water *E. coli*, by inhibiting of enzyme activity. Dithane and *ortho*-Phaltan inhibited activity of purified MDH, but showed less of an effect on the *E. coli* extract. In LDH tests, both enzyme types were similarly inhibited.

81-1063. Schairer, L. A. (Brookhaven Natl. Lab., Upton, NY) **Mutagenicity of ambient air at selected sites in the United States using *Tradescantia* as a monitor.** *BNL Rep.* BNL-27251: 32 pp.; 1979 (36 references).

To fulfill the need for monitoring ambient airborne chemicals, the *Tradescantia* stamen hair system has been adapted for use in a mobile laboratory. Controlled laboratory exposure of *Tradescantia* flower buds to several gaseous mutagens were positive with significant responses at < 0.1 ppm of 1,2-dibromoethane (ethylene dibromide). Mutational response increased linearly with duration of exposure up to about 21 days for both physical (radiation) and chemical mutagens. Hence the stamen hair system achieves its greatest sensitivity with chronic exposures typical of those in populated areas near industrial pollution sources. A mobile monitoring vehicle was assembled utilizing controlled environment growth chambers for both ambient air fumigations and concurrent clean air control exposures. Industrial sites monitored by the mobile laboratory were selected because of known increased coincidence of human cancer and/or high levels of pollutants in vicinity. The ambient air at all sites near petroleum refineries gave positive mutagenic responses in the *Tradescantia* stamen hairs. Smelters and chemical industries showed more varied responses. Preliminary analyses indicate that the highest biological activity was associated with highest levels of vapor-phase organics, especially at the New Jersey site. (Author abstract permission)

81-1064. Saleh, M. A. (Dep. Agric. Biochem., Fac. Agric., Cairo Univ., Giza, Egypt) **Isomerization of lindane by reduced hematin.** *Bull. Environ. Contam. Toxicol.* 25(6): 833-836; 1980 (10 references).

Studies were performed to investigate the

isomerization of lindane by reduced hematin. Pure lindane (γ-HCH) was added to reduced hematin and incubated at 25°C for 72 hr. The products were extracted into hexane, cleaned up by silicic acid column chromatography, and analyzed for products by GC/MS and TLC. Preparative TLC was used to isolate individual HCH (BHC) isomers for identification by NMR. A 0.7% overall yield of a compound matched the TLC chromatograph of the α-HCH isomer, but differed from β-, γ-, and δ-HCH according to MS analysis. The product also co-chromatographed with α-HCH on TLC and gave an NMR spectrum identical to α-HCH. The results indicate that lindane is metabolized to α-HCH but not to β-HCH.

81-1065. Woodward, D. F.; Mauck, W. L. (Columbia Natl. Fish. Res. Lab., US Fish & Wildl. Serv., Jackson, WY 83001) **Toxicity of five forest insecticides to cutthroat trout and two species of aquatic invertebrates.** *Bull. Environ. Contam. Toxicol.* 25(6): 846-854; 1980 (13 references).

The toxicity of aminocarb, trichlorfon, acephate, carbaryl and fenitrothion to cutthroat trout, stoneflies, and amphipods was investigated. Acute toxicity tests were performed and the 96 hr LC50 values were determined for both technical grade and field formulations of the pesticides. Aminocarb field formulation (17% aminocarb) was the most toxic to trout (LC50 = 88 μg/l). Acephate was the least toxic; LC50 100,000 μg/l. Technical grade carbaryl, fenitrothion and trichlorfon LC50 values were 3950, 2880, and 1650 μg/l, respectively. The invertebrate LC50 values were generally dependent upon pH. The LC50 for acephate, pH 6.5 and 8.5, was 25,000 μg/l. LC50 values of 6400 and 21,200 μg/l were obtained at pH values of 6.5 and 8.5 for stoneflies. Other pesticides were considerably more toxic. Fenitrothion LC50 values range from 4.3 (pH 6.5) to 8.8 (pH 7.5). Carbaryl and trichlorfon LC50s ranged from 5.3 to 100 μg/l. The two invertebrates varied greatly in response to aminocarb. For amphipods the LC50s were 1000 and 2200 μg/l at pH 8.5 and 7.5, respectively, and for stoneflies 19 and 26 μg/l, respectively.

81-1066. Giam, C. S.; Murray, H. E.; Ray, L. E.; Kira, S. (Dep. Chem., Texas A&M Univ., College Station, TX 77843) **Bioaccumulation of hexachlorobenzene in killifish (*Fundulus similis*).** *Bull. Environ. Contam. Toxicol.* 25(6): 891-897; 1980 (14 references).

The rate and extent of bioaccumulation in killifish (*Fundulus similis*) continuously exposed to low concentrations of hexachlorobenzene (HCB) were determined. A sand dosing column was used in the exposure aquarium to insure continuous dosing with HCB. Fish were removed from the tank at various intervals and tissues were analyzed for HCB using a gas chromatograph with a ^{63}Ni-electron capture detector. The average bioaccumulation factor was calculated to be 375, and ~ 4.8 hr were required to reach half this factor. The values are considerably lower than others reported for several freshwater species. After an 11-day exposure period, fish were removed to an HCB-free tank, and tissues were again analyzed at regular intervals. After 2 days, HCB concentrations fell from about 70 ng/g to 1.8 ng/g. After 1 wk, HCB tissue concentrations remained 0.8 ng/g. The half-life for HCB loss was calculated to be 9-12 hr.

81-1067. Swartz, W. J. (Dep. Anat., Med. Cent., Louisiana State Univ., New Orleans, LA 70112) **Dissimilarities in the toxic response of early chick embryos to DDT administered in different vehicles.** *Bull. Environ. Contam. Toxicol.* 25(6): 898-901; 1980 (7 references).

Fertile white Leghorn chicken eggs were used to determine whether various vehicles have any effect on DDT embryo toxicity. DDT was dissolved in dimethylsulfoxide (DMSO), sesame oil, or olive oil and then injected into the yolk sac at 5 or 10 mg. After 5 days of incubation, embryos were examined. When compared to controls, no significant increases in embryo mortality occurred in DDT-DMSO exposed eggs. However, the DDT-sesame oil group exhibited a 3-fold increase in mortality over the controls, and DDT-olive oil-exposed embryo mortalities increased 2-fold over controls. It was seen that in embryos receiving olive oil alone, 29.1% failed to survive to 5 days of incubation. In all treatment regimens incidence of malformation in the survivors was negligible. Some factors responsible for the differences in the toxic response to the different vehicles are considered.

81-1068. Naqvi, S. M.; Leung, T. S.; Naqvi, N. Z. (Dep. Biol. Sci., Southern Univ., Baton Rouge, LA 70813) **Toxicities of paraquat and diquat herbicides to freshwater copepods (*Diaptomus* sp. and *Eucyclops* sp.).** *Bull. Environ. Contam. Toxicol.* 25(6): 918-920; 1980 (12 references).

The toxic effects of the herbicides paraquat and diquat on freshwater copepods (*Diaptomus* sp. and *Eucyclops* sp.) were studied. Copepods were isolated from zooplankton samples collected from a natural lake, then exposed to various concentrations of diquat (0-140 ppm) and paraquat (0-100 ppm). Copepod mortality was recorded after 24 and 48 hr, and LC50 values were calculated by probit analysis. Paraquat LC50 values were 10 ppm after 24 hr and 5.3 ppm after 48 hr. The LC50 values for diquat were 74 ppm after 24 hr and 19 ppm after 48 hr. The results are compared with data reported for other copepods.

81-1069. McLeese, D. W.; Metcalfe, C. D. (Fish. & Environ. Sci. Biol. Stn., Dep. Fish. & Oceans, St. Andrews, New Brunswick E0G 2X0, Canada) **Toxicities of eight organochlorine compounds in sediment and seawater to**

***Crangon septemspinosa*. *Bull. Environ. Contam. Toxicol.* 25(6): 921-928; 1980 (18 references).**

Crangon septemspinosa shrimp were used to assess the toxicity of endosulfan, endrin, DDT, dieldrin, technical chlordane, hexachlorobenzene (HCB), Aroclor 1242 and Aroclor 1254. Seawater or sandy sediments were used in the 96-hr static assays. Water and sediment samples were collected from the aquaria at various intervals and analyzed for test compound concentration. In seawater, 96-hr LC50 values were determined to be 0.2 μg/l for endosulfan, 0.6 μg/l for endrin, 0.4 μg/l for DDT, 0.4 μg/l for dieldrin, 2.0 μg/l for chlordane, 13.0 μg/l for Aroclor 1242, 12.0 μg/l for Aroclor 1254 and > 7.2 μg/l for HCB. In general, the organochlorines were found to be about 10-80 times less toxic in sediment than in water. The effects of the sediment-water partitioning properties of the compounds on their toxicities were examined and discussed.

81-1070. McLeese, D. W.; Metcalfe, C. D.; Zitko, V. (Fish. & Environ. Sci. Biol. Stn., Dep. Fish. & Oceans, St. Andrews, New Brunswick E0G 2X0, Canada) **Lethality of permethrin, cypermethrin and fenvalerate to salmon, lobster and shrimp.** *Bull. Environ. Contam. Toxicol.* 25(6): 950-955; 1980 (9 references).

Toxicity tests using the pyrethroid insecticides permethrin, cypermethrin and fenvalerate were carried out on Atlantic salmon (*Salmo salar*), lobster (*Homarus americanus*) and shrimp (*Crangon septemspinosa*). Each compound was tested with each species in 96-hr static assays with up to 6 different concentrations. In addition, whole fish, and shrimp and lobster hepatopancreases, were extracted and analyzed for insecticide concentrations by gas chromatography with ^{63}Ni detection. The 96-hr LC50s and the lethal thresholds indicate that cypermethrin and fenvalerate are more toxic than permethrin, and that invertebrates are more sensitive to all compounds tested than salmon. In lobster, the 96-hr LC50 values were 0.73 μg/l for permethrin, 0.04 μg/l for cypermethrin, and 0.14 μg/l for fenvalerate. Concentration factors were determined for the pyrethroids in salmon from the various toxicity tests. Salmon concentrated the pesticides by factors of 73 for permethrin, 7 for cypermethrin, and 200 for fenvalerate over the 96 hr test period. Pyrethroids were not detected in lobster hepatopancreas or in shrimp, possibly due to the low test concentrations used.

81-1071. Gilderhus, P. A.; Johnson, B. G. H. (Natl. Fish. Res. Lab., US Fish & Wildl. Serv., La Crosse, WI 54601) **Effects of sea lamprey (*Petromyzon marinus*) control in the Great Lakes on aquatic plants, invertebrates, and amphibians.** *Can. J. Fish. Aquat. Sci.* 37(11): 1895-1905; 1980 (29 references).

The chemicals 3-trifluoromethyl- 4-nitrophenol (TFM) or a combination of TFM and 2′,5-dichloro-4′-nitrosalicylanilide (Bayer 73, clonitralide) have been used to control the sea lamprey (*Petromyzon marinus*) in the Great Lakes for about 20 yr. These chemicals cause some mortalities of Oligochaeta and Hirudinea, immature forms of Ephemeroptera (*Hexagenia* sp.), and certain Trichoptera, Simuliidae, and Amphibia (*Necturus* sp.). The combination of TFM and Bayer 73 may affect some Pelecypoda and Gastropoda, but its overall effects on invertebrates are probably less than those of TFM alone. Granular Bayer 73 is likely to induce mortalities among oligochaetes, microcrustaceans, chironomids, and pelecypods. No evidence exists that the lampricides have caused the catastrophic decline or disappearance of any species. The overall impact of chemical control of sea lampreys on aquatic communities has been minor compared with the benefits derived. (Author abstract by permission)

81-1072. Howell, J. H.; Lech, J. J.; Allen, J. L. (Hammond Bay Biol. Stn., US Fish & Wildl. Serv., Millersburg, MI 49759) **Development of sea lamprey (*Petromyzon marinus*) larvicides.** *Can. J. Fish. Aquat. Sci.* 37(11): 2103-2107; 1980 (28 references).

Larvicides are used to control sea lamprey (*Petromyzon marinus*) in the Great Lakes. These larvicides are useful because they are more toxic to sea lamprey than to fish species found in the same habitat. The lampricides come from two classes of chemical compounds: halonitrophenols and halonitrosalicylanilides. Selectivity of the larvicides appears to be based on the differences in the ability of sea lamprey larvae and fishes to detoxify and/or excrete the chemicals. Glucuronide conjugation is an important mechanism for detoxication of these larvicides by fish, and selectivity of larvicides may be due to differences in glucuronyl transferase activity between lamprey and fishes. If more detailed information were available on uptake, metabolism, excretion, and the biochemistry and physiology of lamprey as compared to fishes, it might be possible to design chemicals that would be more selective than those now in use. (Author abstract by permission)

81-1073. Kennard, C. H. L.; Smith, G. (Dep. Chem., Univ. Queensland, Brisbane, Queensland 4067, Australia) **Mode of action theories of DDT-type insecticides.** *Chem. Austr.* 47(10): 399-404; 1980 (12 references).

Various modes of action are suggested for DDT-type (DDT, DDE and TDE) insecticides. For each suggestion, an explanation is offered as to why it is not a complete answer to the question. A current approach involves taking the measurement of stereochemical specifications using X-ray diffraction methods. In order to view possible active sites on the DDT molecule, the molecule is observed from the three major directions. Stereoviews are presented to offer an understanding of the geometry of the DDT molecule. In another, similar, approach, the distances between all atoms are calculated in the molecule and presented in a triangular array. The calculations of bond distance,

bond angle, and torsion angle are discussed mathematically which indicate the small stereochemical differences among these compounds.

81-1074. Bahig, M. R. E.; Fayez, V. (Dep. Radioisot., AEC, Cairo, Egypt) **Excretion and toxicity of cyolane in the rat.** *Chemosphere* 9(10): 635-641; 1980 (15 references).

Male albino rats were used to assess the toxicity of the organophosphorus systemic insecticide cyolane (phosfolan). In excretion experiments, the rats were given single oral doses of ^{14}C-cyolane (specific activity 5 μCi/mg) in corn oil at 2 mg/kg. Urine, feces and expired air were collected, and radioactivity was measured by liquid scintillation counting. The total radioactivity excreted within 24 hr in urine, feces and expired air was 37%, 3.5% and 8.5% of the administered dose, respectively, indicating insecticide accumulation. In toxicity tests, rats were given oral daily doses of cyolane for 16 wk at concentrations of 0.9, 0.45, 0.09 and 0.045 mg/kg (0.1, 0.05, 0.01 and 0.005 LD50, respectively). Animals were sacrificed and enzymes were assayed after 1, 2 and 4 days of treatment, then at weekly intervals. At the two highest doses, nearly all rats died after 6 wk, when enzyme inhibition reached 70% of the control activity. At lower doses, there was a progressive inhibition of brain and blood AChE and liver succinate dehydrogenase until wk 2, and inhibition was nearly constant from wk 2 to 4. At this point, enzyme activity recovered. Mechanisms for this recovery phenomenon are proposed.

81-1075. Bechtel, M. A.; Callen, J. P.; Owen, L. G. (Div. Dermatol., Sch. Med., Univ. Louisville, Louisville, KY) **Etiologic agents in the development of skin cancer.** *Clin. Plast. Surg.* 7(3): 265-275; 1980 (20 references).

Environmental and internal factors thought to be significant in the development of skin cancer are reviewed. A clinical description is presented of the pertinent premalignant and malignant skin lesions. The etiologic factors discussed are ultraviolet radiation from the sun, ionizing radiation (X-rays; γ rays; α and β particles), genetic susceptibility, burns, scars, and inflammatory skin disease, immunosuppression, and chemical carcinogens. Among the many chemicals demonstrated to cause skin cancer is arsenic, which is a component of some insecticides, herbicides and rodenticides. One study showed an increased incidence of cutaneous cancer in a population exposed to high concentrations of arsenic in drinking water.

81-1076. Machol, L. (Author address not given) **Breast-feeding revisited - the good news and some bad news.** *Contemp. OB/GYN* 16(6): 87-90, 97-99, 102-105, 108, 109; 1980 (43 references).

A review of some beneficial and detrimental effects of breast feeding is presented. Many lipid soluble compounds, including organochlorine insecticides and PCB's, can be excreted in milk if the mothers have been exposed to them. Sources and persistence of these compounds are discussed. Careful interpretation of published pesticide levels in milk is recommended because human milk varies widely in fat content. The compounds are soluble in the fat portion of the milk, and reported levels may not be comparable from one study to another.

81-1077. Good, M. L.; Dundee, D. S.; Swindlet, G. (Dep. Chem., Univ. New Orleans, Lakefront, New Orleans, LA) **Bioassays and environmental effects of organotin marine antifoulants.** In: *Controlled Release of Bioactive Materials.* Baker, R., ed. (Academic Press: NY): pp. 387-397; 1980 (13 references).

Bioassays were performed to determine the toxicity of organotin antifouling coatings to molluscs (*Rangia cuneata*) and fish (*Gambusia affinis, Poecillia latipinna,* and *Fundulus grandis*). Tributyltin acetate (TBTA) was added to experimental tanks at concentrations from 0.02 to 1.33 ppm. Concentrations from 0.04 to 1.00 ppm caused distress symptoms in clams after several hr. At 0.04 to 0.09 ppm concentrations, all clams died after 20 days. The lethal concentration for juveniles was < 0.02 ppm. At concentrations of 1.00 and 2.00 ppm, fish died within 20 min to 3 hr. Total mortality occurred within 12 days at concentrations < 0.02 ppm. Further studies are necessary to determine leaching rates, environmental fate, and mode of action of antifouling coatings on fouling organisms. [Presented at the 6th Int. Symp. Controlled Release Soc.]

81-1078. Allen, A. J.; Quitter, B. M.; Radick, C. M. (Environ. Manage. Lab., Univ. Akron, Akron, OH) **The biocidal mechanism of controlled release bis(tri-n-butyltin) oxide in *Biomphalaria glabrata.*** In: *Controlled Release of Bioactive Materials.* Baker, R., ed. (Academic Press: NY): pp. 399-413; 1980 (21 references).

Studies were performed to determine the mechanism of toxic action of bis (tri-n-butyltin) oxide (TBTO). Accumulation of 1-C^{14} TBTO in snail tissues was determined after exposure to the labeled toxin at various rates (0.05-10 ppm) for 0.5 to 168 hr periods. The highest concentration in the head-foot tissue was seen after 120 hr exposure to 0.05 ppm; the lowest concentration occurred after 1 hr exposure to 10 ppm. The results, however, were extremely variable. A similar trend was observed in tissues of the reproductive and digestive systems. Studies on hemolymph protein involvement in TBTO toxicity indicated an accumulation of TBTO in hemolymph, but only at concentrations equal to that of the medium. Protein levels increased with increased dose of TBTO; this was concluded to result from cellular disruption preceding death. Various hemolymph characteristics were observed. Cell fragments, organelles, ghosts of ruptured cells and uniden-

tified debris were observed in the hemolymph of treated cells. Hematocrit values of treated snails, however, were within the range of control snails. It is suggested that the effects of TBTO are due to its combination with proteins. The sites of attachment and the biochemical effects of the combinations are not completely understood. [Presented at the 6th Int. Symp. Controlled Release Soc.]

81-1079. Sahib, I. K. A.; Swami, K. S.; Rao, K. V. R. (Dep. Zool., S. V. Univ., Tirupati 517502, India) **Regulation of glutamate dehydrogenase, ammonia and free amino acids in the tissues of the teleost *Tilapia mossambica* (Peters) consequent to sublethal malathion exposure: a time course study.** *Curr. Sci.* 49(20): 779-782; 1980 (20 references).

An insignificant decrease in time bound changes associated with free amino acids during malathion exposure was noted up to 24 hr in muscle and liver tissue. Decreases in free amino acid content were not consistent throughout the course, but showed significant increases from 24 to 48 hr. This increase suggests increased proteolysis and further suggests this increased pool of free amino acids will serve as a possible energy source after glycogen depletion to meet the energy demands of malathion stress. Time bound changes associated with glutamate dehydrogenase and ammonia generally decreased in muscle, gill and liver tissues of malathion exposed fishes. Gill tissues demonstrated nonsignificant decreases in GDH activity with declines in ammonia levels throughout the time course, resulting in the accumulation of glutamate. Reduction of ammonia content is a possible ichthyological pathway for reducing the toxic impact of malathion.

81-1080. Larsen, G. L. (North Dakota State Univ., Fargo, ND) **The role of enterohepatic circulation in the metabolism of propachlor and propachlor metabolites in the rat.** *Diss. Abstr. Int. B* 41(6): 2154-2155; 1980.

Propachlor has been shown to form six metabolites that contain methylsulfonyl groups. The sulfur in the mercapturic acid pathway metabolites was shown to be the source of the methylsulfonyl sulfur but the respective carbons in these metabolites did not serve as the source of the methylsulfonyl methyl groups. Liver homogenates did not contain a C−S lyase enzyme system(s) that converted the cystein conjugate of propachlor to its corresponding thiol. Bile cannulation studies showed that an oral dose of propachlor was secreted in the bile (and thus into the small intestine) as mercapturic acid pathway metabolites. When mercapturic acid pathway metabolites were dosed orally or intracecallay so that these metabolites would come in contact with the intestine and its microflora, methylsufonyl containing metabolites were isolated from the bile. When mercapturic acid pathway metabolites were dosed iv to bypass the intestine or its microflora, no methylsulfonyl containing metabolites were present in the bile. After oral administration of antibiotics, only mercapturic acid pathway metabolites were isolated in the bile, urine or feces of rats dosed orally with propachlor. These results indicate the following: the enterohepatic circulation pathway exists in which methylsulfonyl containing metabolites are formed in the metabolism of propachlor, and the microflora play a very important role in this pathway because antibiotic treatment blocks the further metabolism of the mercapturic acid pathway metabolites to ten other urinary metabolites and bound fecal metabolites that were formed in conventional rats dosed with propachlor. (Author abstract by permission. Copies of the thesis are available from University Microfilms, order No. 8027588.)

81-1081. Cheng, Y. C. (Univ. Kentucky, Lexington, KY) **The *in vivo* and *in vitro* disposition of ^{13}N-labeled nitrosocarbamates.** *Diss. Abstr. Int. B* 41(6): 2189-2190; 1980.

The *in vivo* and *in vitro* disposition of ^{13}NO-nitrosocarbaryl and ^{13}NO-*N*-nitroso- *N*-chloroethyl-1-chloroethyl carbamate (^{13}NO-BCNC) are described. Nitrosocarbaryl is the nitrosated derivative of carbaryl, which is one of the most widely used carbamate insecticides. Nitrosocarbaryl has been found to be a direct-acting carcinogen; it induced stomach cancer in experimental animals when it was administered orally. The *in vivo* disposition of ^{13}NO-nitrosocarbaryl was found to be completely different from that of ^{13}NO-1,3-bis-(2-chloroethyl)-1-nitrosourea (^{13}NO-BCNU), which was studied previously. For ^{13}NO-nitrosocarbaryl, a fast loss of ^{13}N activity in rats following iv injection was observed. At 1 min after it was administered to the rat, about half of the total radioactivity was lost in the expired air as nitrogen (^{13}N·N). In the case of ^{13}NO-BCNU about 80% of the radioactivity was found to be retained in the rat at 60 min after it was administered by iv injection. Because of the great difference between the *in vivo* disposition of ^{13}NO-BCNU and ^{13}NO-nitrosocarbaryl, ^{13}NO-BCNC, a nitrosocarbamate analog of ^{13}NO-BCNU, was studied. The *in vivo* disposition of ^{13}NO-BCNC was found to be similar to that of ^{13}NO-nitrosocarbaryl. It has been concluded that *in vivo* nitrosocarbamates undergo metabolism by the mechanism generally assumed. The fact that carcinogenicity of nitrosocarbaryl and many nitrosated carbamates was observed locally but not systematically may be due to their extreme instability. In other words, they probably decompose before perfusion into cells where intracellular events are induced. ^{13}NO-Nitrosocarbaryl and ^{13}NO-BCNC decomposed more rapidly in blood and the 9000 *g* supernatant fractions of lung, kidney, and liver homogenates than in pH 7.5 buffer. The metabolism of BCNU must be more complicated that what has been understood. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 8027971.)

81-1082. Hadjibiros, K.; Fayolle, L.; Bouche, M. B. (Lab. Zooecol., F-21034 Dijon, France) **Consequences of the impact of pollutants on earthworms. II. Statistical estimation of risks.** *Doc. Pedozool.* 1(1): 24-32; 1980 (7 references).

Risks to earthworms from environmental pollutants were assessed. Dose response relationships were examined. Data for the pesticides DNOC, DNTBP (dinoterb), methabenzthiazuron, pyrazone (chloridazon), nitrofen, simazine, aldicarb, parathion, methiocarb, dimethoate, lindane, benomyl, maneb, mercury and copper were presented. The log/probit model was applied to the proportion/survival experimental data. Two statistical significance tests were carried out on the results. Survival probability could be predicted for any chemical concentration by means of this model. Difficulties in the use of this model were encountered related to mortality in the controls and choice of inadequate dose rates.

81-1083. Heyl, L. W.; Harris, L. W.; Stitcher, D. L. (Toxicol. Branch, Chem. Syst. Lab., US Army, Aberdeen Proving Ground, MD 21010) **Effects of carbamates on whole blood cholinesterase activity: chemical protection against Soman.** *Drug Chem. Toxicol.* 3(3): 319-332; 1980 (34 references).

Male albino rabbits were used in studies on the acute toxicity of the carbamates isopropyl methylphenylcarbamate (IMPC), pyridostigmine, neostigmine, benzpyrinium, and physostigmine, all of which are reversible inhibitors of cholinesterase (ChE). Whole blood ChE was determined at regular intervals following iv, im, or oral administration of carbamate. In addition, tests were carried out on the degree of protection that these carbamates give against poisoning with pinacolyl methylphosphonofluoridate (Soman). LD50s (im) ranged from 2.2 mg/kg for physostigmine to 22.4 mg/kg for IMPC. The route of administration was found to have an effect of ChE inhibition; iv administration resulted in rapid inhibition and rapid return of blood enzyme activity activity, and oral treatment suppressed ChE activity for many hours. The data show that when rabbits were pretreated with 11% LD50 of the carbamate combined with atropine, benactyzine, mecamylamine or chloropromazine, most animals were protected against a 10-fold LD50 challenge of Soman. This protection was determined to be related to reversible inhibition of ChE by the carbamates.

81-1084. Fariss, M. W.; Blanke, R. V.; Saady, J. J.; Guzelian, P. S.* (Med. Coll. Virginia, Richmond, VA 23298) **Demonstration of major metabolic pathways for chlordecone (Kepone) in humans.** *Drug Metab. Dispos.* 8(6): 434-438; 1980 (22 references).

The metabolism of the organochlorine pesticide chlordecone (Kepone) in humans was investigated. Chlordecone alcohol, a reduced form of chlordecone (CD), has been isolated in human feces; the liver is hypothesized as the site of chlordecone alcohol (CDOH) formation. Bile was collected from CD poisoned factory workers and Sprague-Dawley rats fed diets supplemented with CD. CD and CDOH were determined in the samples by gas-liquid chromatography and mass spectrometry. The results showed substantial amounts (150-1190 ng/ml) of free CD in the human bile, but little (55-270 ng/ml) free CDOH. Pretreatment of the sample with β-glucuronidase resulted in large amounts of CDOH (945-5120 ng/ml). It was found that 72% of CD was excreted as the unaltered compound; 93% of CDOH was excreted as its glucuronide conjugate. Rat bile showed only trace amounts of CDOH, indicating that hepatic metabolism of CD is species-specific. In is concluded that in man the major metabolic route for chlordecone is its reduction in the liver, followed by glucuronidation.

81-1085. Molnar, J.; Molnar, A.; Paksy, K. (Natl. Inst. Occup. Health & Ind. Hyg., Budapest, Hungary) **A szerves foszforsav-eszterek akut inhalacios toxicitasa. [Acute inhalation toxicity of organophosphate esters.]** *Egeszsegtudomany* 24(2): 173-178; 1980 (26 references) (Hungarian).

The acute toxicity of inhaled aerosols of organophosphate ester pesticides was determined in male CFY rats. The length of exposure was 4 hr. The animals that survived the exposure were followed for 2 wk. Most of the animals that died did so during or shortly after exposure. The survivors became clinically symptom-free after 24-48 hr. The LC50 average (and range) values were found to be 34 (23-51) mg/m³ for methyl parathion, 63 (57-69) mg/m³ for monocrotophos, 135 (111-165) mg/m³ for phosphamidon, 165 (142-191) mg/m³ for prothoate, 280 (211-372) mg/m³ for triazophos, and 378 (344-416) mg/m³ for fenitrothion. Analysis of the toxicological parameters of 19 organophosphate ester pesticides from the literature showed no correlation between LC50 and the saturation vapor concentration, but good correlation between the oral LD50 and LC50.

81-1086. Szlobodnyik, J.; Dura, G.; Desi, I. (Natl. Inst. Public Hyg., Budapest, Hungary) **Szerves foszfateszter peszticidek elektromiografias vizsgalata. [Electromyographic examination of organophosphate ester pesticides.]** *Egeszsegtudomany* 24(2): 179-187; 1980 (20 references) (Hungarian).

The effects of dichlorvos (2 and 4 mg/kg/day po), phorate (0.0625 and 0.1250 mg/kg/day po), and bromophos (10 and 46.9 mg/kg/day po) on the peripheral nervous system of random-bred male CFY rats were studied by electromyographic investigations in a 90-day test. The nerve conduction speed of the motor fibers was determined by stimulation of the sciatic nerve and of the tibial nerve. To determine neuromuscular impulse transmission, the sciatic nerve was stimulated by impulses

of different frequencies. Treatment with bromophos and phorate caused a decrease in the amplitude and an increase in the time of the motor response elicited by the indirect stimulation of the planter muscles. Depression of the impulse transmission was observed with 10-150 Hz impulse series following phorate treatment. Dichlorvos and phorate did not cause cholinesterase inhibition. The findings indicate that there is no correlation between the rate of cholinesterase inhibition and the peripheral neurotoxic effects of the three compounds.

81-1087. Lindquist, R. K.; Wolgamott, M. L. (Dep. Entomol., Ohio Agric. Res. & Dev. Cent., Wooster, OH 44691) **Toxicity of acephate to *Phytoseiulus persimilis* and *Tetranychus urticae*.** *Environ. Entomol.* 9(4): 389-392; 1980 (8 references).

Toxicity of acephate to both *Phytoseiulus persimilis* Athias-Henriot, a mite predator, and *Tetranychus urticae* Koch, was measured in a series of experiments. Acephate was more toxic to *P. persimilis* than *T. urticae*, regardless of application method, and significant toxicity occurred via food-chain effects. Acephate application as soil drenches of 75, 150 and 300 ppm were more toxic by this route than foliar sprays, in some cases killing nearly all *P. persimilis* feeding on *T. urticae* 21 days after application. Acephate's usefulness in an IPM program involving *P. persimilis* will be limited by this toxicity, especially if applied to the soil. (Author abstract by permission)

81-1088. Aliniazee, M. T.; Cranham, J. E. (East Malling Res. Stn., Kent, England) **Effect of four synthetic pyrethroids on a predatory mite, *Typhlodromus pyri*, and its prey, *Panonychus ulmi*, on apples in southeast England.** *Environ. Entomol.* 9(4): 436-439; 1980 (10 references).

A field trial on apples in southeastern England showed that pre-bloom pink bud sprays of 4 synthetic pyrethroids, permethrin, cypermethrin, fenvalerate, and decamethrin, were all highly toxic to the predatory mite, *Typhlodromus pyri*, but had no appreciable toxicity to the dominant spider mite species, *Panonychus ulmi*. The virtual elimination of the predatory mite at this growth stage of apples led to a marked population increase of *P. ulmi* later in the same season. The use of these pyrethroids for insect control is incompatible with integrated mite management on apples using *T. pyri*. Laboratory data supported the field results. (Author abstract by permission)

81-1089. Chhabra, R. S. (Environ. Biol. Branch, NIEHS, Research Triangle Park, NC 27709) **Intestinal absorption and metabolism of xenobiotics.** *Environ. Health Perspect.* 33: 61-69; 1979 (40 references).

Possible routes of intestinal absorption of xenobiotics are explored. The five possible routes include active transport, passive diffusion, pinocytosis, filtration through pores, and lymphatic absorption. The major process is passive diffusion, which is not saturable and permits a directly proportional transfer to the concentration gradient and to the lipid-water partition coefficient of xenobiotics. Factors which affect the intestinal absorption of xenobiotics (such as DDT) include bile content, the age of the animal, changes in the motility of the intestinal tract, interference with microorganisms present in the gastrointestinal tract, changes in the rate of gastric emptying, and the dissolution rate of the xenobiotics. The metabolizing enzymes present in the intestine are similar to those in the liver. The *in vitro* metabolism of some drug substrates in various species studied can be stimulated by the administration of foreign chemicals.

81-1090. Hoensch, H. P.; Hutt, R.; Hartmann, F. (Gastroenterol. Sect., Dep. Med., D-7400 Tubingen, BRD) **Biotransformation of xenobiotics in human intestinal mucosa.** *Environ. Health Perspect.* 33: 71-78; 1979 (30 references).

Various foreign compounds including halogenated hydrocarbons, biphenyls, and aromatic hydrocarbons are biotransformed and detoxified by drug metabolizing enzymes, particularly the monooxygenases, located in the liver and in the small intestine. The content of cytochrome P-450 and monooxygenase and NADPH-cytochrome reductase activities were determined using specimens of human small intestine and jejunal biopsy material obtained from patients. Cytochrome P-450 content in surgical samples ranged from 30 to 120 pmol/mg protein. Monooxygenase activity ranged from 60 to 110 pmol/min-mg protein. Patients with total villous atrophy demonstrated no detectable monooxygenase activity, and only low enzyme rates were found in patients with a partial villous atrophy. Patients with steatorrhea and normal histology demonstrated mucosal monooxygenase activities that were higher than patients with villous atrophy, but were still only half of that observed in normal controls. It was concluded that the monooxygenase activity in the human small intestine depends on the morphological integrity of the mucosa, and that the enzyme rates were reduced when malassimilation was present. These factors are predicted to influence the absorption of xenobiotics from the intestinal tract.

81-1091. Schedl, H. P. (Div. Gastroenterol. Hepatol., Dep. Med., Coll. Med., Univ. Iowa, Iowa City, IA 52242) **Intestinal disease and the urban environment.** *Environ. Health Perspect.* 33: 115-126; 1979 (63 references).

Urban diseases of the small and large intestine are reviewed. Various environmental chemicals, including pesticides, act as causative agents in producing these diseases. The review considers the physiology of distribu-

tion of the chemicals in the body, luminal contents of the alimentary tract, limiting membrane and lining cells such as the brush border membrane of small intestine, and the application of this physiological information to the treatment of urban diseases. Specific consideration is given to colon cancer, with emphasis on the influence of dietary factors and bacterial flora.

81-1092. Kitchin, K. T.; Sanyal, M. K.; Dixon, R. L. (Lab. Environ. Toxicol., NIEHS, Research Triangle Park, NC 27709) **Chemical induction of anomalous development of rat embryos cultured *in vitro*.** *Environ. Health Perspect.* 33: 320; 1979.

A method for studying direct and indirect acting teratogens during the critical period of organogenesis is presented, using an *in vitro* embryo culture system. Rat conceptuses of pregnancy day 11 were cultured *in vitro* for 46-48 hr with male rat serum containing chemical agents alone or in combination with male rat liver microsomes. Nitrogen mustard and 2,4,6-triethylenimino-1,3,5-triazine (tretamine) direct acting alkylating agents, significantly inhibited the growth and differentiation of embryos. Cyclophosphamide did not affect growth or differentiation of rat conceptuses when added alone to the culture media. The addition of cyclophosphamide, rat liver microsomes, and NADPH to the embryo culture media, caused increases in the embryonic DNA and protein values to only 9 and 13%, respectively. Organogenesis was adversely affected. It is suggested that microsomal metabolites of cyclophosphamide might be the *in vitro* teratogen instead of the parent compound. Aminopyrine did not adversely affect conceptuses growth or development in similar experiments. It was concluded that the embryo culture system is a sensitive test system for detecting and studying directly or indirectly acting environmental teratogens.

81-1093. Tilson, H. A.; Byrd, M.; Riley, M. (Lab. Behav. & Neurol. Toxicol., NIEHS, Research Triangle Park, NC 27709) **Neurobehavioral effects of exposing rats to Kepone via the diet.** *Environ. Health Perspect.* 33: 321; 1979.

Kepone (chlordecone) was given to male and female Fisher-344 albino rats in doses of 10 or 30 ppm mixed in the food for periods of 51 days. An exaggerated startle response to an air puff stimulus was noted in treated males; females were not significantly effected. Female body wt significantly decreased. No changes in grip strength for fore or hind limbs were noted. At 28 days after treatment was stopped, the only significant lingering behavioral changes were the increased startle response in males exposed to 30 ppm Kepone and increased retention latencies for males exposed to both 10 and 30 ppm and for females exposed to 30 ppm Kepone. Repeated exposures to Kepone increased responsiveness to some types of environmental conditions and possibly impaired the acquisition and retention of a simple avoidance task. Neurotoxicity effects appeared to dissipate with time.

81-1094. James, M. O. (Lab. Pharmacol., C. V. Whitney Mar. Lab., St. Augustine, FL) **Disposition of 2,4-D, 2,4,5-T, DDA and phenylacetic acid in the spiny lobster (*Panulirus argus*).** *Environ. Health Perspect.* 33: 324; 1979.

The metabolism and excretion of 2,4-D, 2,4,5-T, DDA, and PAA were studied using different mammalian and fish species. All acids were taken up from the hemolymph into the green gland and the hepatopancreas. Preferential uptake of 2,4-D and 2,4,5-T by the green gland was noted, and these chemicals were excreted unchanged. PAA was preferentially taken up by the hepatopancreas at a rate of 50-80% in 24 hr. 2,4-D was the most rapidly excreted, followed by DDA and PAA. Compounds taken up by the green gland were excreted rapidly in urine as the parent compound. The compounds adsorbed by hepatopancreas were metabolized and excreted slowly in feces.

81-1095. McConnell, E. E.; Luster, M. I.; Moore, J. A.; Gupta, B. N.; Rakes, A. H.; Goldstein, J. A.; Haseman, J. K.; Parker, C. E. (Environ. Biol. Branch, NIEHS, Research Triangle Park, NC 27709) **Chronic toxicity of technical and analytical pentachlorophenol in cattle.** *Environ. Health Perspect.* 33: 337; 1979.

Female yearling Holstein cattle were used to determine the toxicopathologic effects of technical and analytical grade PCP. Calves were exposed for 160 days to the chemical in their feed at 20 mg/kg/day for 42 days, followed by 15 mg/kg/day for the rest of the experiment. A dose-related decrease in body wt was noted as well as decreased feed efficiency and progressive anemia in technical PCP exposed cattle. These same cattle displayed dose-related increases in liver and lung wt and decreases in thymus wt. Analytical PCP slightly increased liver mixed function oxidase activity, but this was greatly increased by technical grade PCP. Exposed animals demonstrated minimal hepatic lesions of the mucosal lining and bile ducts. Thyroxine levels decreased in all PCP exposed cattle. A progressive dose-related enhancement in the lymphoproliferative response was noted in technical PCP treated animals. Humoral immune parameters displayed little or no changes. It was concluded that toxicity of PCP in cattle results primarily from toxic impurities in PCP formulations.

81-1096. Linko, P. C.; Goldstein, J. A. (Environ. Biol. Branch, NIEHS, Research Triangle Park, NC 27709) **Hepatic effects of technical pentachlorophenol after cutaneous administration.** *Environ. Health Perspect.* 33: 338; 1979.

Technical PCP was administered to female C57BL/6 mice and female Sprague-Dawley rats either dermally or orally to compare route of administration effects on the hepatic mixed function oxidase system. Hepatic aryl hydrocarbon hydroxylase activity was increased 20, 220, and 450% in mice after dermal administration of 30, 100 and 300 mg/kg PCP, respectively, compared to 140, 310 and 410% increases following oral administration. Cytochrome P-450 levels were increased following exposure by either dermal or oral routes. Oral administration also shifted the peak of the CO-difference spectrum from 450 nm to 449 nm and increased the ratio of the ethyl isocyanide difference spectrum. Liver enzymes were not significantly affected by the administration of pure PCP. Technical PCP produced hepatic changes consistent with the presence of chlorinated dibenzo-*p*-dioxins.

81-1097. Lam, H. F.; Takezawa, J.; Van Stee, E. W. (Environ. Biol. Branch, NIEHS, Research Triangle Park, NC 27709) **Evaluation of the effects of paraquat and diquat in rats using pulmonary function tests.** *Environ. Health Perspect.* 33: 338; 1979.

Lung volumes, single breath diffusing capacity of the lungs for carbon monoxide, and static lung compliance were investigated in rats treated with paraquat or diquat. Measurements were taken at 12, 24, 48 and 72 hr after treatment. Total body wt, lung wt, total lung capacity, vital capacity, alveolar volume, diffusing capacity, and static lung compliance were significantly decreased following intratracheal instillation of paraquat at 0.5 mg/kg or after an ip injection of 27 mg/kg. A transient increase followed by a decrease was noted in functional residual capacity. At dose levels of 13.5 mg/kg the effects of paraquat peaked about 24 hr following administration. The data obtained support the pathological changes which have been observed in paraquat damaged lungs: severe damage associated with decreased elasticity of the lungs and thorax were found along with the destruction of gas exchanging alveolar surfaces and edema.

81-1098. Hogan, M. D. (Biom. Branch, NIEHS, Research Triangle Park, NC 27709) **Species-to-species carcinogenesis extrapolation.** *Environ. Health Perspect.* 33: 345; 1979.

Estimates of dosages used in the Meselson Report of health hazards of chemical pesticides were re-evaluated. In the original report, the site of action, relative lifespan and body surface area were taken into account. However, the similarity in lifetime cancer risk between man and the most sensitive animal species tested for each chemical carcinogen studied was even greater than Meselson had originally indicated. The length of exposure became a critical factor in the process of risk estimation when either man or laboratory animal was exposed for significantly less than a normal lifetime.

81-1099. Reuber, M. D. (Exp. Pathol. Lab., Frederick Cancer Res. Cent., NCI, Frederick, MD 21701) **Carcinogenicity and toxicity of methoxychlor.** *Environ. Health Perspect.* 36: 205-219; 1980 (38 references).

A review is presented of studies carried out on the carcinogenicity of the insecticide methoxychlor, a structural analog of DDT. All known studies on the carcinogenicity of methoxychlor in animals were included. The histological sections from these studies were examined whenever possible. The data show methoxychlor to be carcinogenic in the testes of BALB/c male mice, bones of $B6C3F_1$ female mice, ovaries of Osborne-Mendel female rats, livers of C3H and BALB/c mice and Osborne-Mendel rats, and possibly the livers of dogs. This insecticide also increased malignant neoplasms at all sites in male and female BALB/c mice. Studies on miniature swine showed methoxychlor-induced chronic renal disease, along with hyperplasia of the mammary gland and uterus. In rabbits treated with methoxychlor applied to the skin, a dose-related atrophy of the testes and chronic renal disease developed.

81-1100. Kreitzer, J. F. (Patuxent Wildl. Res. Cent., US Fish & Wildl. Serv., Laurel, MD 20811) **Effects of toxaphene and endrin at very low dietary concentrations on discrimination acquisition and reversal in bobwhite quail, *Colinus virginianus*.** *Environ. Pollut. Ser. A* 23(3): 217-230; 1980 (14 references).

Studies using male bobwhite quail was designed to determine whether toxaphene and endrin produce behavioral effects at levels below those that produce overt signs of intoxication. Birds were fed toxaphene at 10 or 50 ppm or endrin at 0.1 or 1.0 ppm for 138 days (beginning at the age of 3 days) prior to testing. Birds were then tested for performance on non-spatial discrimination reversal tasks. Two tests were conducted with toxaphene-treated birds and with endrin-treated birds. The toxaphene-treated birds made 50% more errors than did controls in the first test, but performed equally to the controls in the second test, indicating that the birds were able to adjust to the pesticide during treatment. There was no difference in the effects of the two levels of toxaphene. Endrin-treated birds made 36-139% more errors than controls; lower-dosed birds made significantly more errors than the higher-dosed group. The principal effect of endrin was on ability to solve a novel problem. It is noted that most stimuli are novel during the first spring and summer in the life of a wild bird. Endrin effects were reversed after 50 days on untreated feed. Endrin residues in brains of treated birds were determined to be 0.075 ppm for a 0.1 ppm dose and 0.35 ppm for a 1.0 ppm dose.

81-1101. Russell-Smith, A.; Ruckert, E. (Poplar Farm, Walpole, Halesworth, Suffolk, England) **The effects of aerial spraying of endosulfan for tsetse fly control on**

aquatic invertebrates in the Okovango Swamps, Botswana. *Environ. Pollut. Ser. A* 24: 57-73; 1981 (18 references).

The effects of intentional endosulfan applications on non-target invertebrates and zooplankton of the Okavango Swamps, Botswana, were investigated over a 3 yr period. In 1976, 1977, and 1978, 6-12 g AI/ha were aerially applied and invertebrates and zooplankton were collected from the study areas at various intervals. There were no significant changes in invertebrate or zooplankton populations between sprayed and unsprayed areas. The studies demonstrate that low level spraying of endosulfan for tsetse fly control is unlikely to result in damage to invertebrates or zooplankton in this area.

81-1102. Peppriell, J. (Dep. Biochem., Sch. Med., State Univ. New York, Buffalo, NY 14214) **A comparison of the cytochrome P-450 species induced by mirex and 3,4,5,3′,4′,5′-hexachlorobiphenyl in hepatic microsomes of the mouse.** *Environ. Res.* 23(2): 309-318; 1980 (29 references).

The patterns of hepatic microsomal cytochrome(s) P-450, induced by oral administration of mirex and 3,4,5,3′,4′,5′-hexachlorobiphenyl, resemble those induced by phenobarbital and 3-methylcholanthrene, respectively. Low (30 μmol/kg) and high (120 μmol/kg) doses of mirex elevated the relative concentrations of cytochrome P-450 species having apparent molecular weights of 45,000, 47,000, and 56,000. In microsomes from mice treated with the higher dose, however, the relative concentration of the 56,000-dalton hemoprotein was elevated above that found in hepatic microsomes from mice treated with the lower dose of this compound. The increased relative concentration of this hemoprotein is associated with hypochromic shifts of the carbon monoxide and *n*-octylamine difference spectra of the hepatic microsomal samples. The primary hepatic microsomal hemoprotein induced by 3-methylcholanthrene and 3,4,5,3′,4′, 5′-hexachlorobiphenyl has an apparent molecular weight of 54,000. This hemoprotein can be distinguished from the high-molecular-weight hemoprotein induced by mirex or phenobarbital by polyacrylamide gel electrophoresis in the presence of sodium dodecyl sulfate. The carbon monoxide and *n*-octylamine difference spectra of microsomes from mice treated with 3-methylcholanthrene or the chlorinated biphenyl are similar. (Author abstract by permission of Academic Press)

81-1103. Puzynska, L. (Inst. Food & Nutr., PL-02903 Warsaw, Poland) **Brain biochemistry and learning ability of rats treated with propoxur given in diets of varying protein content.** *Environ. Res.* 23(2): 385-396; 1980 (35 references).

The influence of propoxur on several biochemical brain parameters of 3-wk-old Wistar male rats was tested. The substance was administered for 30 and 50 days at a 9000-ppm concentration in a low-protein diet (4.5% casein; LPD) and in a normoprotein diet (26% casein; NPD). The results of the Hebb-Williams test rating the learning ability of the rats were also analyzed. LPD depressed acetylcholinesterase (AChE) activity in the serum and brain as well as the activity of aromatic amino acid aminotransferase (AAA) in the brain. The brain serotonin (SE), noradrenaline (NA), and protein levels were also lowered. Addition of propoxur depressed still more the enzymatic activities and the NA and protein levels, whereas it increased the SE level. Propoxur given with NPD diminished AChE activity in the brain and serum and AAA activity in the brain, but its effect was less pronounced than when it was included in LPD. The SE, NA, and protein levels then remained unchanged. Rats fed LPD gave poorer results in the Hebb-Williams test than those receiving NPD. Addition of propoxur to LPD did not change the results of this test. On the other hand, rats fed propoxur in a NPD made a greater number of mistakes in solving maze problems of increasing degree of difficulty. (Author abstract by permission of Academic Press)

81-1104. Willis, D. E.; Zinck, M. E.; Darrow, D. C.; Addison, R. F. (Fish. & Mar. Serv., Mar. Ecol. Lab., Bedford Inst. Oceanogr., Dartmouth, Nova Scotia, Canada) **Induction of mixed function oxidase enzymes in fish by halogenated and aromatic hydrocarbons.** *Environ. Sci. Res.* 16: 531-536; 1980 (8 references).

Brook trout were force-fed gelatin capsules containing a single substrate dissolved in an organochlorine-free marine oil every other day to give theoretical tissue concentrations of 200 μg/g for DDT, DDE and Aroclor 1254 and 20 μg/g for 3-methylcholanthrene (3-MC). None of the pollutants produced statistically significant changes in fish body wt, liver wt, or liver protein concentrations. Treatment with *p,p′*-DDT and *p,p′*-DDE produced no differences between control and treated group microsomal protein concentrations. Cytochrome P-450 concentrations were not affected by *p,p′*-DDT or *p,p′*-DDE, but increased slightly in the presence of Aroclor 1254 and 3-MC. Indicators of MFO activity were not changed in fish fed *p,p′*-DDE. It was concluded that feeding Aroclor 1254 or 3-MC caused induction of selected components of the trout mixed function oxidase enzyme system.

81-1105. Kling, D. (Inst. Biol. III, Univ. Tuebingen, D-7400 Tubingen, BRD) **Total atresia of the ovaries of *Tilapia leucosticta* (Cichlidae) after intoxication with the insecticide Lebaycid.** *Experientia* 37(1): 73-74; 1981 (12 references).

The insecticide Lebaycid (fenthion) is repeatedly introduced into fresh water for mosquito and fly control. Effects on non-target organisms, particularly fish, have been observed. This investigation covers the effects periodical release of sublethal concentrations of Lebaycid

has on the ovaries and reproductive activity of *Tilapia leucosticta*. Intoxication with sublethal Lebaycid concentrations led to total atresia of the ovaries in 90% of the treated specimens of *T. leucosticta*. The gonads were filled with atretic follicles and mature eggs were never found. In regeneration trials, intoxicated fish proved to be unable to spawn for at least 9 wk. (Author abstract by permission, supplemented.)

81-1106. Muramatsu, H.; Shiga, T.; Kurisaki, E.; Nagamori, H. (Sch. Legal Med., Fukushima Med. Coll., Fukushima, Fukushima, Japan) **[Effects of a herbicide, paraquat or diquat, on cultured human fetal cells.]** *Fukushima Igaku Zasshi (Fukushima Med. J.)* 30(1-2): 173; 1980 (Japanese).

Actions of paraquat and diquat on cultured human fetal cells were compared during an investigation of the mechanism of selective toxicity of paraquat to the lung. Cultures of fetal lung and skin cells were exposed to paraquat or diquat for 3 hr. Cell mortality was proportional to the concentration of paraquat or diquat. At 50-100 ppm the mortality due to diquat was significantly higher than that due to paraquat. The degree of fatty denaturation at the same concentration was higher in the cells exposed to diquat than those exposed to paraquat. Cells exposed to high paraquat concentrations showed a tendency for vacuole formation. It is suggested that in spite of the large toxicity of paraquat than diquat in the body, the cell toxicity of diquat is larger than that of paraquat.

81-1107. Gangwar, M. P. S.; Lakhchaura, B. D.; Sud, S. C. (Dep. Physiol., Coll. Vet. Sci., G. B. Pant Univ. Agric. & Technol., Pantnagar, Nainital, India) ***In vitro* studies on the effect of certain pesticides on rumen microorganisms of the buffalo.** *Indian Vet. J.* 56(12): 1001-1006; 1979 (16 references).

Inocula for *in vitro* studies were obtained from the rumen of fistulated male buffalo kept on a diet of wheat bhusa, lucerne green and groundnut cake. Insecticides used included metasystox, dimethoate, DDT and BHC. Samples were analyzed for total volatile fatty acids before and after 6 hr incubation with the insecticides. Dimethoate at 1-100 ppm did not affect the production of total volatile fatty acids nor the total protozoal or bacterial counts. Metasystox significantly decreased the total protozoal count at the 10 and 100 ppm levels and also depressed the total viable counts at the 100 ppm level only. A decrease in total volatile fatty acid production was noted in the presence of DDT, regardless of concentration. DDT did not affect total bacterial or total viable counts but did depress the total protozoal counts at concentrations $\geq$ 100 ppm. BHC did not produce any effect on any parameter studied.

81-1108. Crawford, M. J.; Croucher, A.; Hutson, D. H. (Shell Toxicol. Lab., Shell Res. Ltd., Sittingbourne, Kent ME9 8AG, England) **Metabolism of *cis*- and *trans*-cypermethrin in rats. Balance and tissue retention study.** *J. Agric. Food Chem.* 29(1): 130-135; 1981 (11 references).

The fate of the *cis* and *trans* isomers of the pyrethroid insecticide cypermethrin (NRDC 149), α-cyano-3-phenoxybenzyl- 3-(2,2-dichlorovinyl) -2,2-dimethylcyclopropane carboxylate, has been studied in rats (1-5 mg/kg) by using three forms of radiolabeling (benzyl-^{14}C, cyclopropyl-^{14}C, and cyano-^{14}C). Radioactivity derived from the benzyl-^{14}C and cyclopropyl-^{14}C labeling was rapidly eliminated, mostly in the urine. Tissue residues were generally very low, e.g., 0.01 μg/g in brain, with the exception of fat ($\sim$ 1 μg/g). Residues derived from the *cis* isomer tended to be higher than those derived from the *trans* isomer. The rate of depletion of the residues derived from [benzyl-^{14}C]-*cis*-cypermethrin was rapid ($t_{1/2}$ was less than $\sim$ 1 day) from all tissues except fat, from which radioactivity was eliminated with a half-life of 11-12 days. This residue was largely due to unchanged *cis*-cypermethrin. [*cyano*-^{14}C]Cypermethrin afforded radioelimination and distribution characteristics similar to those reported for the cyanide ion. (Author abstract reprinted by permission of the American Chemical Society)

81-1109. Powell, G. V. N.; Gray, D. C. (Patuxent Wildl. Res. Cent., US Fish & Wildl. Serv., Laurel, MD 20811) **Dosing free-living nestling starlings with an organophosphate pesticide, famphur.** *J. Wildl. Manage.* 44(4): 918-921; 1980 (10 references).

Studies were conducted in which starling nestlings were dosed with the insecticide famphur to determine its effects on survival and growth. The young of 12 pairs of free living birds were dosed with 0, 0.3, 1.0 or 3.0 mg famphur/kg/day. From day 4 to 18, the nestlings were weighed, measured and dosed. On day 19 all animals were sacrificed and brain and plasma ChE were analyzed. Growth rates were found to be independent of dose rate. Brain ChE in birds dosed with 3 mg famphur was 85% below controls. Brain and plasma ChE activity levels of birds in the 1.0 and 0.3 mg/kg dose groups were also below those of control groups. The methods used in this study demonstrate a means to circumvent the problems associated with propagating songbirds in captivity, as well as the problems of testing to quantify the effects of pesticide application on young nesting Passeriformes.

81-1110. Kruglov, Iu. V.; Gersh, N. B.; Shtal'berg, M. V. (All-Union Res. Inst. Agric. Microbiol., Moscow, USSR) **Deistvie glifosfata na pochvennuyu mikrofloru. [Effect of glyphosate on soil microflora.]** *Khim. Sel'sk. Khoz.* 18(10): 42-44; 1980 (4 references) (Russian).

The effect of herbicide glyphosate (Round-up:

N-phosphonomethylglycine) on soil microflora was studied. Glyphosate was incorporated into soil at concentrations ranging from 1 to 625 mg/kg. The soil was incubated at optimal temperature and humidity for 1 mo. Soil microorganisms were resistant to glyphosate. High doses of herbicide increased the count of saprophyte microflora (there was a twofold increase at 125 mg/kg and sixfold increase at 625 mg/kg). At the same time, there was an increase of CO_2 release. Glyphosate application increased the number of nitrifying bacteria and increased nitrate accumulation.

81-1111. Hinkle, D. K.; Suggs, J. E.; Jackson, M. D. (Mannheimer Found., Homestead, FL 33030) **Environmental and biological effects following application of diazinon impregnated strips within a laboratory animal room.** *Lab. Anim. Sci.* 30(6): 981-983; 1980 (4 references).

Sprague-Dawley rats were used in studies designed to determine the effects of diazinon-impregnated strips on laboratory animals. Pest control strips are approved for use by commercial pest control operators in control of crawling insects, and may be used in research animal quarters. A total of 80 rats were caged singly in stainless steel wire mesh cages in an animal room measuring 3 × 3.6 m with a 2.4 m high ceiling. Pest control strips containing 10% diazinon were attached to the perimeter of the room; 18 were placed on the wall at floor level and 18 were placed 1 m up on the wall. A portable, high-volume sampler was used to sample air for 2 hr at 0.25, 1, 2, 4, 5, 7, 15 and 30 days after installation of the strips. Diazinon levels in the air samples were determined by gas chromatography. Whole blood samples were collected from 10 rats on days 1, 3, 7, 15 and 30; erythrocyte acetylcholinesterase and plasma pseudocholinesterase activities were determined. Diazinon concentrations in the air never exceeded 1.34 $\mu g/m^3$, and no significant changes were observed in enzyme activities.

81-1112. Lavendar, R. G.; Stark, D. M. (Lab. Anim. Res. Cent., Rockefeller Univ., New York, NY 10021) **Efficacy of propoxur insecticide strip use in laboratory animal facility.** *Lab. Anim. Sci.* 30(6): 984-987; 1980 (6 references).

Five male rats (250 g) were housed for 4 days in an animal room in which propoxur impregnated insecticide strips had been placed 7 days earlier. Five control animals were placed in a similar room that did not contain the insecticide. Blood samples were drawn from the orbital sinus of anesthetized rats. Plasma cholinesterase was determined using a conventional photometric test. All plasma cholinesterase levels were within the normal range for laboratory rats.

81-1113. Boiko, I. B.; Popova, N. G. (Uzbek Res. Inst. Sanit. Public Health & Occup. Dis., Tashkent, USSR) **Biokhimicheskoe issledovanie obmena lipidov pri aterogennom effekte pestitsidov na fone fentiurama. [Biochemical study of lipid metabolism during arteriogenic effect of pesticides in combination with fenthiuram.]** *Med. Zh. Uzb.* (10): 69-70; 1980 (1 reference) (Russian).

To evaluate the possible role of the fungicide Fenthiuram [TMTD (thiram) + γ-BHC (lindane) or heptachlor] in the etiology of the arteriosclerosis, lipid metabolism was studied in rabbits exposed to Fenthiuram alone (at 0.05 LD50 and 0.01 LD50) alone or in combination with cholesterol (0.2 g/kg). It was found that Fenthiuram at 0.05 LD50 caused a significant increase of the cholesterol level in the aorta and β-lipoprotein level in the blood serum. Fenthiuram at 0.01 LD50 was found to enhance the arteriogenic effect of cholesterol.

81-1114. Speakman, J. B.; Nirenberg, H. I. (Inst. Pflanzenpathol. & Pflanzenschutz, Univ. Goettingen, D-3400 Goettingen, BRD) **Mutagenicity of methyl benzimidazol-2-yl carbamate (MBC) towards *Aspergillus nidulans* (Eidam) Winter and *Cladosporium cucumerinum* Ellis & Arth.** *Mutat. Res.* 88(1): 45-51; 1981 (34 references).

The ability of methyl benzimidazol-2-yl carbamate (MBC; carbendazim) to induce point mutations to carboxin and MBC resistance was tested in *Aspergillus nidulans* (Eidam) Winter and *Cladosporium cucumerinum* Ellis & Arth. A sub-lethal concentration (ED50) of MBC, when incorporated into a complete agar medium, induced MBC resistance in germinating conidia of *A. nidulans* and carboxin resistance in germinating conidia of *C. cucumerinum*. The significance of these findings in relation to fungicide resistance in the field is discussed. (Author abstract by permission)

81-1115. Nirenberg, H. I.; Speakman, J. B. (Inst. Pflanzenpathol. & Pflanzenschutz, Georg August Univ., D-3400 Goettingen, BRD) **The pH dependence of the mutagenicity of methyl benzimidazol-2-yl carbamate (MBC) towards *Aspergillus nidulans* (Eidam) Winter and *Cladosporium cucumerinum* Ellis & Arth.** *Mutat. Res.* 88(1): 53-59; 1981 (19 references).

The ability of methyl benzimidazol-2-yl carbamate (MBC; carbendazim) to induce point mutations to carboxin and MBC resistance in *Aspergillus nidulans* (Eidem) Winter and *Cladosporium cucumerinum* Ellis & Arth. was dependent upon the pH value of the agar medium into which it had been incorporated. The relevance of this in relation to testing chemicals for a possible mutagenic activity with microorganisms is discussed. (Author abstract by permission)

81-1116. Yamauchi, T. (Sch. Public Health, Fukushima Med. Coll., Fukushima, Fukushima, Japan) **[Effect of experimental thinness and obesity of the delayed neurotoxicity of the organophosphorus pesticide Phosvel.]** *Nippon Eiseigaku Zasshi (Jpn. J. Hyg.)* 35(5): 782-793; 1980 (24 references) (Japanese).

The relationship between hen adipose tissue and the delayed neurotoxicity of Phosvel (leptophos) was investigated. Obese hens were produced by forced tube feeding for 3-4 wk. Thin hens were produced by 2 wk of fasting. Leptophos was administered po at 100, 150, 200, 300 and 500 mg/kg to groups of 5 obese, thin or normal hens. Ataxia was observed in 2 of 5 normal hens and 3 of 5 thin hens at 150 mg/kg. Doses of 200, 300 or 500 m/kg produced paralysis and death in 4 of 5, 5 of 5, and 5 of 5 thin birds, respectively. Obese hens exhibited symptoms at doses > 200 mg/kg. At 500 mg/kg symptoms were observed in 5 of 5 normal hens and 4 of 5 obese hens; death occurred in 2 of 5 hens of the normal group. Delayed neurotoxicity was observed in 12 of 25 of the normal group, 8 of 25 in the obese group, and 17 of 25 in the thin group. Mortality was 5 of 25 in the normal group, 1 of 25 in the obese group, and 14 of 25 in the thin group. Greater neurotoxicity occurred in thin hens. It was also suggested that fasting animals may be more susceptible to the toxic effects of organophosphorus compounds.

81-1117. Ando, M.; Wakisaka, I. (Natl. Inst. Environ. Stud., Tsukuba, Ibanaki, Japan) **[On the relationship between the administered amount of *p,p'*-DDE and the rate of its excretion.]** *Nippon Koshu Eisei Zasshi (Jpn. J. Public Health)* 27(10): 776; 1980 (Japanese).

p,p'-DDE was administered ip to groups of female Wistar rats. Feces were collected at predetermined intervals to determine *p,p'*-DDE excretion. *p,p'*-DDE levels were determined by gas chromatography provided with EC detector after Florisil column cleanup. Excretion of *p,p'*-DDE was rapid for about 3 days after administration. Excretion then slowed, and showed a pattern explicable by a 3 compartment model for 25 and 50 mg/kg doses. The half life of the administered *p,p'*-DDE was 708 days after administration of 25 mg/kg and 951 days after the 50 mg/kg dose. The rate of excretion 20 days after administration was slow, stable, and suitable for comparison of the fluctuations of residual amounts of *p,p'*-DDE in living bodies. It is suggested that these findings partly explain the recent slower rate of reduction of organochlorine pesticide residues in the human body.

81-1118. Rajendran, S.; Muthu, M. (Cent. Food Technol. Res. Inst., Mysore 570013, India) **Nutritional and histopathological studies on rats fed energy food fumigated with acrylonitrile.** *Nutr. Rep. Int.* 22(5): 677-685; 1980 (28 references).

A short term study was carried out to determine the possible effects of consumption of energy food (wheat, 54%; brown sugar, 27%; chickpea, 9%; peanut cake, 9%, vitamin mix, 0.9%; and calcium carbonate, 0.9%) treated with acrylonitrile (AN) on rats. Groups of rats were fed a reference diet with casein as the protein source, energy food control diet, energy food treated with 40 mg/l AN, or energy food treated with 400 mg/l AN for 8 wk. Gas chromatographic analyses showed that about 3 and 18 ppm of AN residues remained in the 40 mg/l and 400 mg/l diets, respectively. Food intake and body wt gain were measured daily for determination of the protein efficiency rate (PER). After 8 wk, liver brain and testes were removed and weighed, liver and brain examined histologically, and hemoglobin, RBC and WBC determinations carried out. Except for the reference diet, there were no significant differences between PER values of different groups. Hematological data and organ wt did not differ between fumigated and unfumigated diets. Histopathological studies of the brain showed no differences. Liver damage was observed in 25% of rats fed diets fumigated with 400 mg/l AN. It was concluded that harmful residues do not occur in energy food fumigated with an insecticidal dose of AN.

81-1119. Trankina, M. L.; Beitz, D. C.; Griffith, D. R.; Ware, D. R. (Dep. Zool., Iowa State Univ., Ames, IA 50011) **Effects of an organophosphate, ronnel, on growth in male rats.** *Nutr. Rep. Int.* 23(1): 37-42; 1981 (13 references).

Male Sprague-Dawley rats were given ronnel in feed at 2, 4, or 6 mg ronnel/kg body wt for 11 wk. Rats fed 2, 4, or 6 mg/kg had body wt gains of 14.5, 9.7, and 14.7 g more than controls, 6.6, 4.5, and 6.8% greater, respectively. No significant differences were found between treated and control rats for wet wt of liver, kidneys, small intestines, testes, heart, or adrenal, pituitary, and thyroid glands. It is suggested that ronnel-induced changes in the production of hormones by the adrenal, pituitary and thyroid glands should be investigated.

81-1120. de Domenech, E. E. M.; Domenech, C. E.; Balegno, H. F.; de Mendoza, D.; Farias, R. N. (Cat. Quim. Biol., Dep. Biol. Mol., Fac. Cienc. Exactus Fis. Quim. & Nat., Univ. Nacl. Rio Cuarto, 5800 Rio Cuarto, Argentina) **Pesticide action: different response of erythrocyte membrane acetylcholinesterase to inhibition by organophosphorus compounds under varied dietary conditions.** *Pestic. Biochem. Physiol.* 14(1): 1-4; 1980 (10 references).

Adult male Sprague-Dawley rats were fed 5% corn oil- or lard-supplemented diets for 15 wk before collection of blood samples by heart puncture. Erythrocyte membranes were prepared, incubated with various concentrations of malathion (1.25-25 μM) and acetylcholinesterase (AChE) activity was determined. AChE inhibition changed

with the diet; the curve was sigmoid after supplementation with corn oil and hyperbolic after supplementation with lard. In addition, the pesticide concentration required to produce 50% inhibition was lower in membrane from lard-supplemented rats. When membranes from lard-fed rats were pre-incubated with cortisol or isoproterenol, the curve changed from hyperbolic to sigmoid. These results indicate that when some hormone induced structural modifications occur in the membranes the allosteric chemistry of the pesticide is activated.

81-1121. Sudershan, P.; Khan, M. A. Q.* (Dep. Biol. Sci., Univ. Illinois, Chicago, IL 60680) **Metabolic fate of (^{14}C)endrin in bluegill fish.** *Pestic. Biochem. Physiol.* 14(1): 5-12; 1980 (15 references).

The uptake, elimination and metabolism of [^{14}C]endrin was studied in bluegill fish, *Lepomis macrochirus*. Thirty-two paired fish were exposed to 1 ppb [^{14}C]-endrin for 48 hr under static conditions. After exposure the fish were transferred to insecticide-free water for 8 days, and the rate of elimination was determined by determining the radioactivity released in the water at various intervals. In addition, during the 8-day post-exposure period, fecal material was aspirated out of the fish by slow suction, and analyzed for radioactivity. The major organs were then removed and analyzed by TLC and autoradiography. Bluegills absorbed 85% of the endrin from the water, and eliminated this absorbed endrin linearly with a half-life of about 4 wk. The principal mechanism of endrin biotransformation in bluegill is hydroxylation, followed by conjugation. The conjugated metabolites 12-anti-hydroxyendrin and 12-syn-hydroxyendrin were tentatively identified.

81-1122. Nakatsugawa, T.; Bradford, W. L.; Usui, K. (Dep. Environ. & For. Biol., Coll. Environ. Sci. & For., State Univ. New York, Syracuse, NY 13210) **Hepatic disposition of parathion: uptake by isolated hepatocytes and chromatographic translobular migration.** *Pestic. Biochem. Physiol.* 14(1): 13-25; 1980 (17 references).

The behavior of parathion in isolated rat hepatocytes and in the perfused liver was investigated. Hepatocyte suspension was mixed with [^{35}S]-parathion in Waymouth's medium, aliquots were drawn, and the reaction was stopped at various intervals by the addition of trichloroacetic acid. Samples were analyzed for parathion and ^{35}S-labeled metabolites. Parathion was absorbed rapidly and reversibly by the isolated hepatocytes. These data suggest that in the perfused liver, parathion might be completely absorbed by periportal hepatocytes and and migrate downstream chromatographically through the lobule. This was verified by parathion infusion experiments. The distribution coefficient and other variables were calculated in order to quantify the uptake. The usefulness of this chromatographic feature for non-histological investigation of intralobular hepatocyte heterogeneity is discussed.

81-1123. Kurihara, N.; Suzuki, T.; Nakajima, M. (Radioisot. Res. Cent., Kyoto Univ., Kyoto 606, Japan) **Deuterium isotope effects on the formation of mercapturic acids from lindane in rats.** *Pestic. Biochem. Physiol.* 14(1): 41-49; 1980 (13 references).

Experiments were performed to determine the effects of deuterium on the metabolism of lindane in rats. Lindane, or [d_6]-lindane or a 1:1 mixture of lindane and [d_6]-lindane were given to rats ip. Urine was collected and metabolites were identified and assayed. The studies indicated that the rate-determining hydrogenation and dehydrochlorination was essential in the pathway of the formation of di- and trichlorophenylmercapturic acid intermediates in lindane metabolism. Significant isotope effects (k^H/k^D = 2.4 to 3.5) were associated with *in vivo* formation of these two intermediates from a 1:1 mixture of normal and hexadeuterated lindane. The 1,2-dechlorination to tetrachlorocyclohexane followed by glutathione conjugation appears to occur in the monochlorophenylmercapturic acid metabolite of lindane. No significant isotope effects were associated with this intermediate.

81-1124. Sidra, M. S.; Walker, C. H. (Dep. Physiol. & Biochem., Univ. Reading, Reading RG6 2AJ, England) **The metabolism of *p,p'*-DDT by the feral pigeon (*Columba livia*).** *Pestic. Biochem. Physiol.* 14(1): 62-71; 1980 (14 references).

The metabolic fate of DDT in the pigeon, particularly the long-term production of persistent metabolites, was studied. Pigeons were dosed ip with 0.7 mg [^{14}C]DDT/bird (1.5-2.2 mg/kg) or with 14.2 mg [^{14}C]DDT/bird (32-38 mg/kg). Male rats were dosed in a similar manner for comparison of excretion data. Pigeon and rat excreta and pigeon tissues were collected at various intervals and total ^{14}C was determined by scintillation counting. Chromatographic methods were used to isolate the metabolites. After 28 days, only 16% of the 1.5-2.2 mg/kg dose label had been excreted by pigeon. At the higher dose, 5.4% of the label was eliminated by pigeons and 87% was recovered in the tissues. The rate of ^{14}C excretion was higher in the rat. In pigeons, the apolar compounds DDE, DDT, and DDD (TDE) accounted for 88% of the remaining ^{14}C in tissues. DDE accounted for 93% of the ^{14}C present in tissues and excreta. Two polar metabolites were also isolated; *p,p'*-DDA and a monohydroxy derivative of *p,p'*-DDT.

81-1125. Morello, A.; Repetto, Y.; White, R. A.; Agosin, M.* (Dep. Zool., Riverbend Res. Lab., Univ. Georgia, Athens, GA 30602) **The metabolism of R-20458 {(E)-6,7-epoxy-1-(4-ethylphenoxy)-3,7-dimethyl-2-octene} in rat hepatocyte suspensions.** *Pestic. Biochem. Physiol.* 14(1): 72-80; 1980 (12 references).

Studies were performed to investigate the metabolism of R-20458 and juvenile hormone I (JHI) in rat hepatocyte suspensions. Rat hepatocytes were suspended

and incubated with [^{14}C]R-20458 (0.73 mCi/mmol) or [^{3}H]-JHI (2.1 mCi/mmol). At timed intervals, 1.0 ml aliquots were analyzed for metabolites. Inhibition experiments were run similarly but with SKF 525-A, diethylmaleate, or 1,2-epoxy-3,3,3- trichloropropane added. R-20458 metabolism is characterized by NADPH-dependent cytochrome P-450 and epoxide hydrolase reactions. JHI metabolism, on the other hand, was primarily by carboxylesterase, epoxide hydrolase, and glutathion-*s*-transferase. The metabolites are listed, and those inhibited by SKF 525-A are discussed. It appears that the inhibitors diethyl maleate and 1,2-epoxy-3,3,3- trichloropropane had no effects on the metabolism of R-20458.

81-1126. Gaughan, L. C.; Engel, J. L.; Casida, J. E. (Pestic. Chem. & Toxicol. Lab., Dep. Entomol. Sci., Univ. California, Berkeley, CA 94720) **Pesticide interactions: effects of organophosphorus pesticides on the metabolism, toxicity, and persistence of selected pyrethroid insecticides.** *Pestic. Biochem. Physiol.* 14(1): 81-85; 1980 (11 references).

Studies were performed to determine the possible effects of organophosphorus pesticides (OP) on the activity of pyrethroid insecticides. Mice were given ip injections of EPN, profenofos, sulprofos, or DEF at 4 and 25 mg/kg, then 1 hr later an injection of fenvalerate, permethrin, cypermethrin or malathion. Cabbage looper larvae and adult female houseflies were treated topically with either the pyrethroid, the OP compounds, or a mixture of each. Bean plants were treated with various OP compounds at 20 to 200 ppm. At 24 hr, 2 ppm ^{14}C permethrin was applied. At 1 to 3 wk, leaves were analyzed for permethrin. Liver homogenates of pesticide treated mice were used to assay pyrethroid esterase activity. Profenofos, sulprofos, EPN and DEF inhibited liver pyrethroid esterase. Profenofos, EPN and DEF increased fenvalarate toxicity by 25-fold and malathion toxicity by about 100-fold. Toxicity of *cis*-cypermethrin was enhanced by OP compounds in both the cabbage looper larvae and the housefly, but *trans*-permethrin was not affected. The OP compounds had no effect on the persistence of permethrin on bean foliage.

81-1127. Ueyama, I.; Takase, I. (Agric. Chem. Inst., Nihon Tokushu Noyaku Seizo K.K., Tokyo 191, Japan) **Fate of prothiofos (*O*-2,4-dichlorophenyl *O*-ethyl *S*-propyl phosphorodithioate) in rats.** *Pestic. Biochem. Physiol.* 14(1): 98-110; 1980 (28 references).

Prothiofos was administered orally to rats at 60 mg/kg after a 16 hr fast. At 1, 3, 8, 24, 48, and 120 hr after treatment the rats were sacrified and blood and various other tissues were analyzed. Three other rats were fed equimolar mixtures (10 mg/kg) of (deuterated) do- and d_5-prothiofos and feces and urine were analyzed at 8, 24, and 48 hr post-dosing. The pesticide was absorbed by the small intestine, and was essentially removed from the GI tract within 24 hr. After 3 hr, all tissues had reached maximum absorption of the pesticide. After 3 hr the levels diminished rapidly. Metabolite studies indicated that the major urinary metabolites are 2,4-dichlorophenol, *O*-2,4-dichlorophenyl *O*-ethyl-hydrogen phosphorothioate, and *O*-2,4-dichlorophenyl *O*-ethyl hydrogen phosphate. In feces a small percentage (3.8%) of prothiofos was detected, but the oxygen analogs were not found. The low toxicity of this pesticide to mammals is thought to be due to the capacity to depropylthiolate the prothiofos molecule.

81-1128. Giovannetti, M.; Riess, S. (Cent. Stud. Microbiol. Suolo, CNR, I-56100 Pisa, Italy) **Effects of soil applications of systemic fungicides on bulb formation in onions.** *Plant Soil* 57(2-3): 463-465; 1980 (9 references).

The effects of 5 different systemic fungicides on the growth of onions and the possible effect on the occurrence of vesicular arbuscular mycorrhizal infection were investigated. Chemicals employed included Sistesan (thiabendazole; 0.12 g/l AI), Plantvax (oxycarboxin; 0.3 g/l AI), Saprol (triforine; 0.28 g/l AI), Afugan (pyrazophos; 0.15 g/l AI), and Bavistin (carbendazim; 0.5 g/l AI). Sistesan depressed average bulb diameter, and fresh and dry wt. Bavistin had the same effects but to a lesser extent. Plantvax was far less toxic to the onions. Afugan was not phytotoxic and exhibited no deleterious effects on bulb formation. Saprol similarly did not inhibit onion growth. None of the fungicides eliminated vesicular-arbuscular mycorrhizal populations, but did significantly depress them. No correlation was noted between percentage mycorrhizal population and bulb size.

81-1129. Rudzki, E.; Napiorkowska, T. (Dermatol. Clin., Acad. Med., PL-02008 Warsaw, Poland) **Odczyny krzyzowe i pseudokrzyzowe w obrebie tiuramow. [Cross-reactions and pseudo-cross-reactions within the group of thirams.]** *Przegl. Dermatol.* 67(4): 433-438; 1980 (10 references).

A tolerance to different formulations of thiram in patients allergic to other formulations of thiram was noted in tests with tetramethylthiram disulfide, tetramethylthiram sulfide, tetraethylthiram disulfide, and the fungicides Sadoplon 75 (75% thiram) and seed dressing T (50% thiram). It was found that allergic reactions to the fungicides were much less frequent than to the vulcanization accelerators. However, very small quantities of the fungicides caused secondary allergic reactions in patients with a primary allergy to rubber. Cross-reactions and pseudo-cross-reactions within the thiram group of vulcanization accelerators and fungicides, and cross-reactions within the thiram group of vulcanization accelerators and disulfiram, were discussed. The role of side chains in the development of these reactions was stressed.

81-1130. Sekeles, E.; Bark, H. (Vet. Hosp., Ben Gurion Univ. Negev, Beer Sheva, Israel) **Fatal complication of subinvolution of the uterus in the dog by warfarin poisoning. A case report.** *Refu. Vet.* 36(1): 16-18; 1979 (7 references).

A case of anticoagulant (warfarin) poisoning of a 2-yr-old Irish Setter that was found to be in subinvolution of the uterus is reported. The resulting uterine hemorrhage was fatal. The dog was brought for examination due to massive bleeding from the vulva. She had whelped 6 healthy pups 2 wk earlier. Discharge from the vulva turned sero-hemorrhagic after 1 wk and its amount decreased significantly. About 24 hr prior to hospitalization she started bleeding profusely. Her owner had spread rat poison containing warfarin in his yard several days earlier. Four hr after admission the dog died. Autopsy revealed an enlarged uterus and the uterine horns displayed ampullar swellings. The uterus contained a large amount of fresh clotted and unclotted blood. Bleeding was traced to all subinvoluted placental sites.

81-1131. Saunier, C.; Horsky, P.; Hartemann, D.; Schrijen, F.; Gille, J. P. (Rech. Physiopathol. Respir., Unite U14, INSERM, Nancy, France) **Pentose pathway in pulmonary fibrosis due to chronic paraquat poisoning.** *Respiration* 40(2): 69-75; 1980 (15 references).

Dogs were used in studies to analyze the relationship between pentose pathway activity and pulmonary fibrosis due to chronic paraquat (PQ) poisoning. Fourteen beagle dogs were dosed with 2-3 mg PQ/kg body wt (iv). Five dogs were dosed once; the remainder received 3-6 doses over a period of several wk. Dogs were sacrificed on days 16 to 69. At necropsy lung tissues were analyzed for glucose-6-phosphate dehydrogenase (G-6-PDH), glutathione reductase (GR), glutathione peroxidase (GSH-Px), and lactate dehydrogenase (LDH) activities. Tissues were also examined by light microscopy. Single doses reduced GR and GSH-Px activities. However, repeated doses resulted in higher activities for all enzymes. Activity levels were not significantly higher after multiple doses than in controls. The extent of pulmonary fibrosis correlated to the activities of G-6-PDH, GSH-Px, and the total PQ dose. Although LDH was reduced after a single dose, it did not correlate to dose or extent of fibrosis.

81-1132. Tarar, J. L.; Salpekar, C. R. (Dep. Bot., Univ. Nagpur, Nagpur 400001, India) **Relative tolerance of soil algae to some selected insecticides.** *Sci. Cult.* 46(3): 105-107; 1980 (6 references).

Investigations of the tolerance of algae to the pesticides malathion, Daimor, endosulfan, Hexadrin (endrin), BHC, and DDT. Five grams of soil and 20 ml of each pesticide, at three different concentrations (0.2%, 0.4% and 0.6%) were incubated at room temperature in 200 ml De's modified Benecks medium for 60 days. Algae were monitored throughout the test. Twenty algal taxa were present initially in the soil samples. *Chlorococcum humicolo* was most resistant to the insecticide treatments at all concentrations. *Cylindrospermum musicola* was high susceptible to all concentrations of all insecticides. Endosulfan was the most toxic, followed by malathion, Hexadrin, BHC, Daimor, and DDT.

81-1133. Tsuzuki, K.; Tanabe, Y.; Sato, C.; Noguchi, H.; Ito, S.; Amano, I.; Inagaki, Y.; Yoshida, T.; Mori, K. (Dep. Pediatr., Chukyo Hosp., Aichi, Japan) **[Charcoal hemoperfusion of an infantile case of accidental paraquat dichloride intoxication.]** *Shonika (Pediatr. Jpn.)* 21(13): 1591-1594; 1980 (7 references) (Japanese).

A 1-yr, 9-mo-old-girl was found playing with an opened bottle of 24% paraquat dichloride formulation. No abnormal findings were noted at preliminary examination. The child vomited early in the morning of the day following exposure, and iv therapy was started. She began bloody vomiting and was hospitalized. Paraquat was detected in the urine. At hospitalization, erosion of mucous membranes of the oral cavity and general dehydration were noted. Charcoal hemoperfusion was carried out for 3 hr after hospitalization. Fluid supplementation and iv flurosemide were administered. On day 3 paraquat was almost undetectable in the urine. Charcoal hemoperfusion was carried out on days 3 and 4. Serum creatinine was 1.1 mg/dl at hospitalization, but subsequently reduced to normal. Low-chlorine alkalosis of pH 7.58 and serum chlorine of 80 meq/l were observed due to the large amount of low-chlorine fluid supplement, the removal of gastric fluids and the use of flurosemide. The symptoms were controlled by iv administration of the high-chlorine fluid supplement. IV treatment was continued until hospital day 7. Occult blood in feces became negative on hospital day 11. The patient was discharged 22 days after hospitalization.

81-1134. Torstensson, L. (Natl. Swedesh Environ. Prot. Board, Stockholm, Sweden) **Effects of pesticides on soil organisms. 2. Microorganisms.** *SNV Rep.* SNV-PM-1208: 154 pp.; 1979 (251 references).

The scientific literature concerning effects of pesticides on the microorganisms of the soil was surveyed and the results given in tabulated form for each pesticide. For the sake of clarity, the microorganism flora has been subdivided into five different levels of function: single microorganisms species; populations of microorganisms; changes within the total microorganisms flora; groups of microorganisms with a special function; and enzyme activity of the soil. Suggestions for optimization of tests for effects of pesticides on soil microorganisms are given. There are three major areas for improvements: increased knowledge of the function of soil ecosystems; standardization of test methods and test conditions; and evaluation of test results. (Author abstract by permission)

81-1135. Marwaha, J.; Freedman, R.; Hoffer, B. (Dep. Pharmacol., Health Sci. Cent., Univ. Colorado, Denver, CO 80262) **Electrophysiological changes at a central noradrenergic synapse during thallium toxicosis.** *Toxicol. Appl. Pharmacol.* 56(3): 345-352; 1980 (23 references).

The actions of chronically administered thallous acetate were studied electrophysiologically at a central noradrenergic synapse. Administration of thallous acetate (4 mg/kg for 7 days) to rats produced a significant increase in the spontaneous discharge rate of cerebellar Purkinje neurons. Experiments with various pharmacologic agents were performed to determine if this increase in spontaneous rate was due to interference with the noradrenergic innervation of the Purkinje neurons. Rats treated with thallous acetate were resistant to parenterally administered amphetamine and haloperidol; these agents decrease and increase, respectively, the spontaneous Purkinje neuron discharge in control (sodium acetate treated) rats. 6-Hydroxydopamine (6-OHDA) administered intracisternally to sodium acetate treated rats produced pronounced increase in spontaneous Purkinje cell discharge, whereas this catecholaminergic- specific neurotoxin did not alter the basal discharge rate of thallous acetate treated rats. Locus coeruleus stimulation produced potent inhibitions of Purkinje neuron discharge in sodium acetate treated animals, but such stimulation was without effect on Purkinje cells from thallous acetate treated animals. Taken together, these data suggest that thallium intoxication causes a reduction in catecholaminergic input into central neurons. Such changes may contribute to the neurological sequelae of thallium toxicosis. (Author abstract by permission)

81-1136. Ecobichon, D. J.; Comeau, A. M.; Cameron, P. H. (Dep. Pharmacol. & Ther., McGill Univ., Montreal, Quebec H3G 1Y6, Canada) **Chronic toxicity of technical fenitrothion in male rats.** *Toxicol. Appl. Pharmacol.* 56(3): 409-417; 1980 (18 references).

Weanling male Wistar rats were given 0.5, 1.0, 5.0, or 10.0 mg/kg body wt of technical fenitrothion in peanut oil by daily oral gavage for 12 mo. Each mo, 10 vehicle and 5 insecticide treated rats from each group were killed, tissues (liver, kidney, brain, spinal cord, and sciatic nerve) were preserved for morphological examination and the effects of treatment were assessed by measuring changes in activities of blood plasma pseudocholinesterase, erythrocytic and brain acetylcholinesterase (AChE), and hepatic and renal non-specific carboxylesterase (CE) as well as routine hematology and serum biochemistry. At 12 mo, administration was stopped and the survivors were held for an additional 2 mo to monitor the recovery from the biological effects of the treatment. No changes were observed in the routine hematological or serum biochemical parameters measured during the treatment period at any of the doses administered. The morphological changes observed could not be related either to the vehicle or to a dose dependent effect of fenitrothion. A dose dependent inhibition of the tissue esterases was observed. Little change was measured at 0.5 and 1.0 mg/kg/day. Marked reduction in hepatic CE, brain, and erythrocytic AChE activities were observed at doses of 5.0 and 10.0 mg/kg/day within 1 mo of treatment and remained relatively constant for the duration of treatment. Within 1 mo after treatment was stopped, tissue esterase levels were within normal limits with the exception of the brain AChE in rats given the two larger doses. Within 2 mo after treatment was terminated, tissue esterase activities of all treated rats were comparable to control activities. (Author abstract by permission)

81-1137. Saxena, M. C.; Siddiqui, M. K. J.; Bhargava, A. K.; Seth, T. D.; Krishnamurti, C. R.; Kutty, D. (Ind. Toxicol. Res. Cent., Lucknow 226001, India) **Role of chlorinated hydrocarbon pesticides in abortions and premature labor.** *Toxicology* 17(3): 323-331; 1980 (16 references).

A correlation between chlorinated hydrocarbon levels and spontaneous abortions and premature labor was investigated in 40 pregnant women. Twenty women went into labor at 12-32 wk gestation and the other 20 went into labor at full-term; full-term women were used to obtain control values. Blood samples were drawn 8-12 hr before delivery and were analyzed for organochlorine pesticides. Placental tissues were also analyzed. Mean pesticide levels in blood of women who aborted or delivered prematurely were 149 ppb BHC, 56 ppb lindane, 32 ppb aldrin, 103 ppb DDE, 39.6 ppb DDD (TDE), 90.55 ppb DDT and 250.6 ppb DDTR. In full-term women these values were 53, 18.5, 10, 12, 6.5, 4 and 25 ppb of BHC, lindane, aldrin, DDE, DDD, DDT, and DDTR, respectively. Mean pesticide levels in placental tissues were 28 and 73.57 ppb BHC, 8.56 and 25 ppb lindane, 3 and 18.5 ppb aldrin, 11.79 and 52 ppb DDE, 4.85 and 16.7 ppb DDD, 3.66 and 90.55 ppb DDT and 22 and 250 ppb DDTR in full-term women and those with premature births or abortions, respectively. These highly significant differences indicate organochlorine pesticides are involved in termination of pregnancy. Higher organochlorine levels were significantly correlated to earlier onset of abortion of premature labor. Although the mechanism of action is not known, it is postulated that the estrogenic effects of organochlorines is involved.

81-1138. Savides, M. C.; Oehme, F. W.* (Comp. Toxicol. Lab., Kansas State Univ., Manhattan, KS 66506) **Urinary metabolism of orally administered *ortho*-phenylphenol in dogs and cats.** *Toxicology* 17(3): 355-363; 1980 (34 references).

The urinary metabolism of orally administered *o*-phenylphenol (OPP) in dogs and cats was investigated. Doses of 2.03, 0.27, 2.04 and 1.16 OPP/kg were administered daily to puppies, dogs, kittens and cats, respec-

tively. Urine samples were collected weekly and analyzed for metabolites. At both ages dogs excreted more OPP as sulfate and glucuronide than was excreted by cats. Adult dogs excreted 25% as much glucuronide as excreted by puppies. Adult and immature cats excreted the same amounts of the metabolites. In all animals, the dominant excretory product was unchanged OPP.

81-1139. Ocampo, J. A.; Hayman, D. S. (Secc. Microbiol., Estac. Exp. Zaidin, Granada, Spain) **Effects of pesticides on mycorrhiza in field-grown barley, maize and potatoes.** *Trans. Br. Mycol. Soc.* 74(2): 413-416; 1980 (22 references).

Vesicular-arbuscular mycorrhizal (VAM) fungi populations were studied in pesticide-treated plots of barley, maize and potatoes grown in sandy loam or clay loam soil. VAM fungi responses to benomyl, dazomet, aldicarb, chlortoluron, chlorfenvinphos, phorate, thiabendazole and carbofuran varied. Effects on numbers of spores/100 g soil, % root length populations, % cortex populations, entry points/cm root and vesicles/cm root were tabulated and statistically analyzed. Benomyl consistently decreased VAM fungi in all soils for all crops. Dazomet and phorate also had significant negative effects on VAM fungi. Aldicarb was extremely variable in its effects. It was concluded that VAM fungi are detrimentally affected by fungicides, general biocides, nematicides and insecticides. These decreases in VAM spore numbers can adversely affect crop growth.

81-1140. Aulerich, R. J.; Coleman, T. H.; Polin, D.; Ringer, R. K.; Howell, K.S. (Dep. Poult. Sci., Michigan State Univ., East Lansing, MI) **Toxicology study of diisopropyl methylphosphonate and dicyclopentadiene in mallard ducks, bobwhite quail and mink.** *US NTIS AD Rep.* AD-A087,257/2: 345 pp.; 1979 (92 references).

This study was conducted to determine the toxicity and tissue residue accumulation, of diisopropyl methylphosphonate (DIMP) and dicyclopentadiene (DCPD) in wildlife. The toxicity was evaluated by acute (LD50), subacute (LC50) and chronic tests with mallard ducks, bobwhite quail, and mink. Tissue residue analyses for DIMP and DCPD were conducted with mallard ducks and bobwhite quail. Based on the results of the LD50 tests, DIMP was only slightly toxic to the test animals. An LD50 of 1490, 1000, and 503 mg/kg body wt was determined for the mallard, bobwhite, and mink, respectively. Birds fed the diets with radioactive DIMP had ^{14}C residues averaging < 1 ppm which declined to less than detection limits, averaging 0.04 ppm, in most tissues, by day 3 after withdrawal. All tissues but skin were clear of residue by day 5 off radioactive feed. Skin had 0.05-0.01 ppm at that time. In the dosing experiment, residues at hr 2 were 5.1-756 ppm, depending upon tissue and species. The residues, however, decreased rapidly with a biological half-life of ~2.7 hr. Most tissues were at, or below detection limits in 48 hr and clear at 65 hr, based on the half-life value. DIMP was not concentrated in the adipose tissue of either the ducks or quail. (Author abstract by permission)

81-1141. Snodgrass, H. L., Jr. (Environ. Hyg. Agency, US Army, Aberdeen Proving Ground, MD) **Toxicological assessment of Abate (trade name) (O,O,O′,O′-tetramethyl-O,O′-thio-di-*p*-phenylene phosphorothioate) dermal penetration of radio-labeled Abate, September 1977-October 1979. Phase I.** *US NTIS AD Rep.* AD-A083, 661/9: 17 pp.; 1980 (3 references).

The dermal penetration of radio-labeled ^{14}C-Abate (temephos) was measured in rats, rabbits, and dogs. Absorption was assessed by monitoring excreted radioactivity in urine and feces for 7 days and analysis of representative tissue specimens at the end of the test period. It is concluded that topically applied abate should not present a dermato-toxic hazard to man following a single application and absorption would be expected to be less than 3% of the applied dose. No evidence of bodily retention or pooling of the radioactive moiety has been demonstrated in these tests. (Author abstract by permission)

81-1142. Clement, J. G.; Lee, M. J. (Defense Res. Estab., Suffield, Alberta, Canada) **Convulsions and organophosphate poisoning: significance of changes in levels of blood gases, glucose and insulin.** *US NTIS AD Rep.* AD-A083,952/2: 14 pp.; 1980 (17 references).

The significance of changes in blood glucose, insulin and gases in soman-induced convulsions in rats was investigated. It was found that neither hypoglycemia nor hypoxia was a contributing factor in the soman-induced convulsions. (Author abstract by permission)

81-1143. Yogendra, M. P.; Santolucito, J. A. (Environ. Monitor. Syst. Lab., Las Vegas, NV) **Selected toxicological studies of Dimilin in weanling male rats.** *US NTIS PB Rep.* PB80-177,868: 18 pp.; 1980 (12 references).

The effects of subacute doses of Dimilin (diflubenzuron; 1-(4-chlorophenyl) -3-(2,6-difluorobenzyl) urea) on the reproductive system of weanling male rats were examined over a period of 96 days. The parameters evaluated were: plasma testosterone level, growth of reproductive organs (testes, prostate, seminal vesicles) and adrenal glands, and histological examination of tissues for pathological changes associated with the administration of Dimilin. The animals, 25-days-old, were given 0, 15, 150, and 300 mg/kg/day of Dimilin suspended in vegetable oil by ig intubation for periods of 0, 14, 28, 42, and 96 days. The data indicate that Dimilin had no adverse effects on body wt or organ wt of weanling rats, but a decrease in circulating testosterone in the plasma of the animals of

prepubertal age was noted. However, this effect of Dimilin began to disappear with the onset of puberty. The histological examination of the test animals with lower circulating testosterone in plasma failed to reveal any Dimilin-induced changes in interstitial or germinal cells. On the basis of these observations, it is concluded that Dimilin, at 15, 150, and 300 mg/kg/day, transiently depresses the testosterone in plasma in the prepubertal period, yet has no delaying effects on the development of the reproductive organs. (Author abstract by permission)

81-1144. Short, R. D.; Minor, J. L.; Unger, T. M.; Breeden, B.; VanGoethem, D. (Midwest Res. Inst., Kansas City, MO) **Teratology of a zineb formulation.** *US NTIS PB Rep.* PB80-181,175: 28 pp.; 1980 (7 references).

The purpose of the present study was to evaluate the teratogenic potential of a zineb formulation. An initial toxicity study indicated that oral doses of 1000 or 2000 mg/kg/day adversely affected the wt gain of nonpregnant rats but not nonpregnant mice. In the teratology study, pregnant rats and mice received daily oral doses of 0, 200, 632, or 2000 mg/kg from day 6 of gestation until the day before C-section. Maternal welfare, as monitored by body wt and food consumption, was affected only in rats that received 2000 mg/kg/day of the formulation. Evidence of embryo or fetal lethality was not present in rats or mice. However, fetuses from rats that received 2000 mg/kg/day of the formulation had a reduced body wt. Some anomalies were significantly increased in rats that received 2000 mg/kg/day of the formulation. These anomalies included hydrocephalus, split centra, incompletely ossified frontal bones, and enlarged occipital fontanel. None of the anomalies observed in mice were increased to a statistically significant level in any of the groups treated with the formulation. This study indicated that the zineb formulation produced anomalies in rats at doses which adversely affected maternal welfare. In addition, these was no evidence of teratogenicity in mice treated with similar doses. (Author abstract by permission)

81-1145. Hollingworth, R. M.; Yim, G. K. W. (Dep. Entomol., Purdue Univ., Lafayette, IN) **Toxicity, interactions, and metabolism of formamidine pesticides in mammals.** *US NTIS PB Rep.* PB80-205,867: 116 pp.; 1980 (111 references).

The overall goal of this research project was to investigate the mechanism(s) of acute toxicity of formamidine pesticides in mammals using chlordimeform (*N'*-(4-chloro-*o*-tolyl)-*N,N*-dimethylformamidine) and its metabolites as the primary model compounds. The role of biotransformations, particularly *N*-demethylation reactions, in generating potentially toxic metabolites was also studied. By comparing the effects of hepatic microsomal mixed function oxidase inducers and inhibitors administered *in vivo* on toxicity, metabolism, and distribution of metabolites in mouse tissues, it was concluded that although *N*-demethylation products are innately more toxic than chlordimeform, they are also less stable, and the best correlation of toxicity was obtained with the total level of formamidines in the brain, rather than with the level of any individual metabolite. In a series of studies with dogs, rabbits, and cats, the cause of death was found to be cardiovascular collapse accompanied by respiratory arrest. Cardiovascular collapse resulted primarily from a peripheral local anesthetic-like effect of chlordimeform. Monoamine oxidase inhibition was not a major factor in lethality. Respiratory arrest was central in origin. Several other central effects of the formamidines were described, some of which may be local anesthetic actions, and a behavioral profile for chlordimeform poisoning in the rat was developed. The effectiveness of various drug treatments as potential therapeutic aids for formamidine intoxication were studied. Formamidines also have aspirin-like actions due to an inability to inhibit prostaglandin synthesis. (Author abstract by permission)

81-1146. Allen, J. D.; Daniels, R.E. (Water Resour. Res. Cent., Maryland Univ., College Park, MD) **Sublethal effects of pollutants: test of the usefulness of life tables for evaluating the impact of chronic toxicity.** *US NTIS PB Rep.* PB80-216,674: 69 pp.; 1980 (35 references).

The estuarine copepod *Eurytemore affinis* and the fresh water daphnid *Daphnia pulex* were used to test the usefulness of the intrinsic rate of population increase, *r*, as a chronic bioassay statistic. The toxicant used was dieldrin, a highly persistent organochlorine pesticide. Three hypotheses were tested: the intrinsic rate of population increase is not affected until the 48 hr acute lethal concentration (LC50) is reached; *r* decreased proportionately with increasing dieldrin concentration; and *r* is affected well below the LC50 value. For *E. affinis*, *r* declined precipitously at 5 ppb, which is 20% of the experimentally determined LC50 of 23 ppb. This decline is attributable to increased time to reproductive maturity, increased time between broods and increased mortality of pre- and post-reproductive females. This decline is representative of the third hypothesis. For *D. pulex*, *r* declined at 200 ppb, which is 80% of the experimentally determined concentration where 50% of the animals were effectively damaged (EC50) of 251 ppb. This decline in *r* is attributable solely to increased mortality in reproductive females and is representative of the first hypothesis. It is concluded that *r* is a better predictor of the sensitivity of *E. affinis* to dieldrin than the LC50, while *r* and the EC50 are approximately equal in predicting *D. pulex* and *E. affinis* toxicity. It is suggested that *E. affinis*, and copepods in general, may be more suitable chronic bioassay organisms than *D. pulex*. (Author abstract by permission)

81-1147. Douze, J. M. C.; van Heijst, A. N.; de Jong, Y.; ten Ham, M. (Dep. Reanim. & Clin. Toxicol., Univ.

Hosp., Utrecht, The Netherlands) **Butyl hydroxyl toluene BHT a lipid-soluble antioxidant in the treatment of experimental paraquat intoxication.** *Vet. Hum. Toxicol.* 21(SPPL): 114-115; 1979.

The toxic effects of paraquat can only be manifested in the presence of oxygen. The free radical compounds initiate lipid peroxidation in cell membranes and membranes of intracellular structures. This is particularly significant in the lipid mid-zone of the membrane containing chains of multiple unsaturated fatty acids. The action of BHT (a lipid antioxidant used as an additive in human and animal foods) in prevention of signs of paraquat intoxication, was investigated. BHT was administered ip for 3 days to 15 Wistar rats at a dose of 250 mg/kg. On the fourth day they received 30 mg/kg paraquat dichloride iv. A second group of Wistar rats were poisoned with 25 mg/kg paraquat and treatment with BHT began at the same dosage on the same days as in the earlier group. In a third group rats were treated with BHT as earlier described, but the first dose was given 30 min after a median lethal dose of paraquat. BHT-pretreated rats showed a decrease in mortality rates. [Presented at the joint annu. mtg. of the Eur. Poison Control Cent. and Int. Assoc. Forens. Toxicol.]

81-1148. de Monchy, J. G. R.; Snoek, W. J.; Sluiter, H. J.; Uges, D. R. A.; Meyer, S.; de Jager, A. E. J. (Intensive Resp. Care Unit, Univ. Hosp., Groningen, The Netherlands) **Treatment of severe parathion intoxication.** *Vet. Hum. Toxicol.* 21(SPPL): 115-117; 1979 (8 references).

After intoxication either through adsorption from the skin, respiratory tract, conjunction, gastro-intestinal tract or following injection, parathion is rapidly metabolized to paraoxon. Intoxication results in cholinergic overstimulation of the central and peripheral nervous system. The muscarinic receptor is initially stimulated and later paralyzed. Treatment consists of atropine and an oxime to regenerate acetylcholinesterase by splitting the enzyme-paraoxon complex. Two specific cases using high dose parathion are reviewed. The use of extreme atropine is cautioned against due to the possible increase in central atropine intoxication. [Presented at the joint annu. mtg. of the Eur. Poison Control Cent. and Int. Assoc. Forens. Toxicol.]

81-1149. Peoples, S.; Maddy, K. (Worker Health & Saf. Unit, Div. Pest Manage., Dep. Food & Agric., Sacramento, CA 95814) **Poisoning due to ingestion of the rodent poison, Vacor.** *Vet. Hum. Toxicol.* 21(SPPL): 216-218; 1979.

Vacor, DPF 2% Bait and DLP 10% tracking powder contain the active ingredient 1-(3-pyridyl-methyl)-3-(4-nitrophenyl) urea (pyriminil), which has a median lethal dose of 4.5 mg/kg for rats and 80 mg/kg for mice. Several reports of serious human poisonings have led to the conclusion that the median lethal dose for man is closer to that in the rat than in mice. Niacinamide may counteract the toxicity of the chemical, but it must be administered within 1 hr after ingestion. Vacor, DPF 2% Bait and DLP 10% tracking powder have been withdrawn from the market. Symptoms of human poisoning include nausea, vomiting, abdominal pain, chills and mental confusion. After about 1 wk more severe symptoms develop, including postural hypotension, generalized weakness, neuropathy of autonomic and motor nerves, and glycosuria, polyuria, and ketoacidosis resulting from diabetes mellitus. If these problems cannot be controlled, death may result within a few days to a month. [Presented at the joint annu. mtg. of the Eur. Poison Control Cent. and Int. Assoc. Forens. Toxicol.]

81-1150. Kooijman, S. A. L. M. (Div. Technol., Soc. TNO, NL-2600 AE Delft, The Netherlands) **Parametric analyses of mortality rates in bioassays.** *Water Res.* 15(1): 107-119; 1981 (15 references).

Results of several bioassays in which groups of organisms were exposed to a range of concentrations of test compounds were subjected to parametric analyses. The model presented is applied most successfully in aquatic toxicity tests, although it may also be utilized in mammalian toxicology studies. The theory behind the model is based on the principle of maximum likelihood, and the concentrations of toxins are chosen so that at least one group of organisms experiences significant but not excessive mortality. The model may aid in the determination of accumulation and elimination behavior of test compounds through the manipulation of mortality data. A technique is given for estimating the disappearance rate of the test compound in a semistatic bioassay from the mortality rates of the test species. The model has been successfully applied to one and two-sample tests using *Poecilia reticulata* guppies exposed to 0.0-3.2 mg/l PCP in freshwater bioassays. Other compounds tested in the model on various aquatic species included cupric chloride, cadmium chloride, 1,2,3-trichloropropane, *p*-chlorophenol and an industrial waste (DSB).

81-1151. Jones, A. R.; Gibson, J. (Dep. Biochem., Univ. Sydney, Sydney, New South Wales 2006, Australia) **1,2-Dichloropropane: metabolism and fate in the rat.** *Xenobiotica* 10(11): 835-846; 1980 (54 references).

The metabolism of 1,2-dichloropropane in the rat has been investigated. The major urinary metabolite has been isolated and identified as *N*-acetyl-*S*-(2-hydroxypropyl)cysteine. Two minor metabolites of 1,2-dichloropropane have been identified as β-chlorolactate and *N*-acetyl-*S*-(2,3-dihydroxypropyl)cysteine. The fate of 1-chloro-2-hydroxypropane, a proposed intermediate metabolite of 1,2-dichloropropane, has been investigated. Apart from its known urinary metabolite, *N*-acetyl-*S*-(2-

hydroxypropyl)cysteine, two oxidative metabolites were detected. These were identified as β-chlorolactadldehyde and β-chlorolactate. A pathway is proposed for the metabolism of and fate of 1,2-dichlorpropane in the rat. This accounts for previous observations made for the fate of radioactivity from administration of 1,2-dichloro[1-^{14}C]propane. The microbial and mammalian metabolism of several halogen-containing foreign compounds is discussed. (Author abstract by permission)

81-1152. Imre, R.; Petro, E.; Vermes, E. (Lab. Pestic. Toxicol., Plant Prot. Agrochem. Cent., Keszthely, Hungary) **Video scanning for measurement of mean red cell diameter on rat blood films.** *Z. Versuchstierkd.* 22(4): 230-233; 1980 (6 references).

The effects of a fungicide on red blood cell (RBC) diameter were investigated. Rats were fed 100, 500, 2500 and 5000 ppm *p*-chlorophenylazo-cyanoacetic acid (ethyl ester) (CH-306) daily for 3 mo. Half of the rats were sacrificed after 1 mo and the rest at the end of 3 mo. Histological, hematological and biochemical evaluations were performed. RBC diameters in females were 7.32 μm for controls and 7.52 μm at 100 ppm, 7.67 μm at 500 ppm, 8.52 μm at 2500 ppm and 9.57 μm at 5000 ppm. RBC diameters in control males were 7.92 μm, and 7.62, 7.87, 8.00, and 8.52 μm, respectively, in males at the 4 dose levels. The differences in diameter, determined by an automatic image analyzer, demonstrate anisocytosis was induced by the fungicide CH-306.

81-1153. Makawi, A. A.; Abdel-Nasser, M.; Abdel-Moneim, A. A. (Dep. Agric. Microbiol., Fac. Agric., Menia Univ., Menia, Egypt) **Quantitative effects of some pesticides on certain physiological groups of microorganisms in soil.** *Zentralbl. Bakteriol. Parasitenkd. Infektionskr. Hyg. Abt. 2* 134(3): 223-228; 1979 (28 references).

Data were collected on the effect of Temik (aldicarb; mixed with soil at a rate of 10 kg/feddan), Orthocide (captan; mixed with soil at a rate of 5 kg/feddan) and Treflan (trifluralin; mixed at the rate of 1 *l*/feddan) on numbers of aerobic cellulose-decomposers, *Azotobacter*, N-fixing clostridia, ammonifiers and nitrifiers. The effects differed depending on the pesticide and on the physiological properties of the microorganism studied. Cellulose-decomposers were either stimulated or depressed in number depending on the chemical. *Azotobacter*, N-fixing clostridia, and ammonifiers exhibited some temporary slight stimulation, but the effects of pesticides on these species were generally depressive. The autotrophic nitrifying bacteria, and in particular the ammonium-oxidizers, appeared more sensitive; their counts in treated soil were sharply depressed.

81-1154. Bal, H. S. (Author address not given) **Teratogenicity of pesticides, fungicides and their effect on mammalian reproductive systems.** *Zentralbl. Veterinaermed. Reihe C* 9(1): 89-90; 1980.

Methoxychlor was given at 100-200 mg/kg to male and female rats for 70 and 21 days, respectively, prior to mating. Mating results were negative. Methoxychlor inhibited spermatogenesis in the male and affected folliculogenesis in the female. Fatty changes were apparent in the Sertoli or Sustentacular cells. Spermatogonia showed complete disorganization. The blood testis barrier was disintegrated. Ethylenethiourea was given to rats at 300 mg/kg. Pregnant rats were dosed on day 12 of gestation. The 196 fetuses demonstrated exencephaly (38%), hydrocephaly (30%), and hydraencephaly (20%) associated with agnathia, micrognathia, abnormal limbs and tail defects. Incomplete osteogenesis of the skull bone was noted. Spinal cords of fetuses with cranial defects also demonstrated hypoplastic degeneration distortion and absence of the spinal canal.

See also 81-0902, 81-0903, 81-0905, 81-0906, 81-0907, 81-0908, 81-0909, 81-0913, 81-0914, 81-0915, 81-0917, 81-0918, 81-0920, 81-0921, 81-0926, 81-0927, 81-0928, 81-0929, 81-0930, 81-0931, 81-0932, 81-0933, 81-0934, 81-0935, 81-0936, 81-0937, 81-0938, 81-0940, 81-0941, 81-0943, 81-0952, 81-0957, 81-0958, 81-0959, 81-0972, 81-0982, 81-0986, 81-0992, 81-1015, 81-1016, 81-1021, 81-1024, 81-1025, 81-1026, 81-1027, 81-1028, 81-1029, 81-1030, 81-1031, 81-1032, 81-1033, 81-1034, 81-1035, 81-1036, 81-1037, 81-1038, 81-1039, 81-1040, 81-1043, 81-1046, 81-1047, 81-1048, 81-1049, 81-1166, 81-1175 *and* 81-1194.

81-1155. Ogan, K.; Katz, E. (Perkin-Elmer Corp., Norwalk, CT 06856) **Liquid chromatographic separation of alkylphenols with fluorescence and ultraviolet detection.** *Anal. Chem.* 53(2): 160-163; 1981 (8 references).

The liquid chromatography of 19 alkylphenols is described. Phenols are used in the manufacture of many substances, including pesticides. Conditions were chosen to separate as many of these compounds as possible, resulting in better separation than has been previously reported. The detection of these compounds by UV and fluorescence was compared. Fluorescence detection gave detection limits lower than those from UV detection at 274 nm and detection limits comparable with those from UV detection at 215 nm. Chromatographic analysis of a coal liquefaction sample demonstrated the benefits of the spectral selectivity offered by fluorescence detection. (Author abstract reprinted by permission of the American Chemical Society)

81-1156. Millar, J. D.; Thomas, R. E.; Schattenberg, H. J., III (Dep. Environ. Sci., Southwest Res. Inst., San Antonio, TX 78284) **Determination of organochlorine pesticides and polychlorinated biphenyls in water by gas chromatography.** *Anal. Chem.* 53(2): 214-219; 1981 (10 references).

A study has been made of procedural steps involved in assaying organochlorine pesticides and polychlorinated biphenyls in water. Generally, excellent recoveries were obtained for 25 priority pollutants extracted with dichloromethane and 15% dichloromethane in hexane at pH 2, 7, and 10. The effects of pH, temperature, and residual chlorine (2 ppm) on the preservation of these substances for a period of 7 days were determined, and the best conditions for storage are given. Elution of the substances from Florisil and alumina cleanup columns gave excellent recoveries. Application of the method to 5 wastewaters was attempted. Three of the wastewaters could be satisfactorily analyzed, spiked, and reanalyzed at zero time and after storage for 7 days under selected physical conditions. Two of the wastewaters could not be analyzed completely because of irreducible amounts of electron capture-sensitive interferences. (Author abstract reprinted by permission of the American Chemical Society)

81-1157. Mulligan, K. J.; Caruso, J. A.; Fricke, F. L. (Dep. Chem., Univ. Cincinnati, Cincinnati, OH 45221) **Determination of polybrominated biphenyls and related compounds by gas-liquid chromatography with a plasma emission detector.** *Analyst (London)* 105(1256): 1060-1067; 1980 (12 references).

Polybrominated biphenyl and related compounds (DDT, PCBs) were separated by gas-liquid chromatography and monitored by a microwave-induced plasma emission detector. The helium plasma was sustained at atmospheric pressure in a Beenakker cavity. By following the bromine emission at 478.55 nm, linear ranges of at least 10^3 with detection limits (signal to noise ratio = 3) of the order of 1 ng were achieved. These results are compared with those obtained with an electron capture detector and the advantages of the element selectivity of the plasma system are illustrated. (Author abstract by permission)

81-1158. Aldrige, W. N.; Street, B. W. (Mol. Toxicol. Sect., Toxicol. Unit., MRC Lab., Carshalton, Surrey SM5 4EF, England) **Spectrophotometric and fluorometric determination of tri- and di-organotin and -organolead compounds using dithizone and 3-hydroxyflavone.** *Analyst (London)* 106(1258): 60-68; 1981 (15 references).

For the spectrophotometric determination of organotins and organoleads using dithizone, a suitable buffer system has been devised with adequate buffering capacity at pH 9, containing EDTA to complex interfering inorganic metals and a high concentration of sodium perchlorate suitable for increasing the distribution of the lower organotins in favor of the solvent. Trioganotins and triorganometals form complexes with a ratio of dithizone to organometal of 1:1; with diorganotins and diorganoleads the corresponding ratio is 2:1. Whether in practice this theoretical ratio is achieved depends upon the distribution coefficient (chloroform: buffer) and the affinity constant of the organometal for dithizone. Under the experimental conditions here, the affinity constant of triethyltin for dithizone is 3×10^5 *l*/mol. Of a large series of triorganotins and organoleads, only trimethyltin and triphenyltin form fluorescent complexes with 3-hydroxyflavone (excitation 400 nm, emission 514 nm). All of the other organotins and organoleads form complexes with absorbance maxima at 385 nm. Dimethyltin, although not forming a fluorescent complex, interferes in the determination of trimethyltin by quenching its fluorescence. By the measurement of fluorescence emission at 514 nm and absorbance at 385 nm mixtures of dimethyltin and trimethyltin can be determined. (Author abstract by permission)

81-1159. Tanaka, A.; Nose, N.; Hirose, A.; Watanabe, A. (Saitama Inst. Public Health, Urawa, Saitama, Japan) **Application of an improved steam distillation procedure in residue analysis. Part II. Determination of 2-phenylphenol in citrus fruits by a spectrophotometric method.** *Analyst (London)* 106(1258): 94-99; 1981 (14 references).

A procedure is described for determining 2-phenylphenol (OPP), which is based on the formation of an indophenol dye, by reaction with *N,N*-diethyl-*p*-phenylenediamine and potassium hexacyanoferrate(III) in alkaline medium. The intensely colored blue product is extracted from the aqueous reaction mixture with 2-methylpropan-1-ol. Absorbances measured at 660 nm obey Beer's law for concentrations of 2-phenylphenol between 0.20 and 8.00 μg/ml. The extraction of 2-phenylphenol

from citrus fruits and the subsequent separation of interfering substances give recoveries ranging between 92.5 and 98.8% and a detection limit of 0.31 ppm is obtained. The procedure is suitable for routine use. (Author abstract by permission)

81-1160. Pryce, J. D. (Pathol. Dep., Ipswich Hosp., Ipswich IP4 5PD, England) **A discrete plasma cholinesterase assay adapted for batch analysis.** *Analyst (London)* 106(1258): 120-121; 1981 (2 references).

The use of thiocholine derivatives and DTNB (Ellman's reagent) has been combined with a single-point assay to form a single procedure for assay of batches of samples for plasma cholinesterase. The procedure involves addition of 1.5 ml DTNB working reagent to one tube for a reagent blank and to tubes for each test. Test plasma (10 μl) was rinsed into each tube. All tubes were mixed and incubated for 2-3 min. First, 0.5 ml of substrate was added to each tube and mixed and, at 3 min, 0.5 ml quinidine sulfate was added. Absorbances were read at 412 nm against a water blank. Reagent blank absorbance was subtracted from the absorbance of the test solutions.

81-1161. de Beer, P. R.; van Dyk, L. P. (Plant Prot. Res. Inst., Dep. Agric. & Fish., Pretoria 0001, Republic of South Africa) **An ultraviolet detector for automated size exclusion chromatographic cleanup of lipid-containing residue samples.** *Bull. Environ. Contam. Toxicol.* 25(6): 861-865; 1980 (2 references).

UV detection for automated size exclusion chromatographic cleanup of lipid-containing samples is described. A LKB 8300A Uvicord II UV detector was coupled to a GPC-Autoprep-1001. Ten percent m/v (1 g/10 ml) lipid solutions (in toluene: ethyl acetate mixtures) were injected into the system. The sensitivity of this system was excellent as evidenced by nearly full scale deflection with 0.5 g of lipid. The collection cycle can be adjusted according to the chromatogram, thus obtaining more accurate collections. The elution times for pesticides are discussed and this procedure is recommended for pesticide analysis laboratories.

81-1162. Smith, K. F.; Cooke, M. (Dep. Inorg. Chem., Univ. Bristol, Bristol BS8 ITS, England) **Heterogenous hydrodechlorination of toxaphene.** *Bull. Environ. Contam. Toxicol.* 25(6): 866-872; 1980 (18 references).

Studies were carried out on the heterogenous catalytic hydrodechlorination of toxaphene, as a step in the analytical procedure for toxaphene. Palladium and platinum were used as catalyst materials. Gas chromatographs equipped with flame ionization detectors or ^{63}Ni electron capture detectors were used for analysis. Chromatographs of toxaphene after passage over the catalysts were presented, and the reactions involved in the hydrodechlorination are described. It was seen that both catalysts hydrodechlorinated toxaphene to a significant extent, but skeletal degradation occurred before complete reduction was achieved. It is pointed out that analysis of toxaphene is difficult because reduction of toxaphene by heterogenous catalysis yields a complex mixture of hydrocarbons.

81-1163. Cavallaro, A.; Bartolozzi, G.; Carreri, D.; Bandi, G.; Luciani, L.; Villa, G.; Gorni, A.; Invernizzi, G. (Lab. Prov. Ig. & Profil. Reparto Chim., Milano, Italy) **A method for the determination of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin at ppt levels in vegetables by high-resolution gas chromatography and low-resolution mass spectrometry.** *Chemosphere* 9(10): 623-628; 1980 (14 references).

A method is presented for the determination of dioxin at the ppt (parts per trillion) level by a combination of high-resolution GC and low-resolution MS. A multilayer glass column (20 mm × 250 mm) was filled with anhydrous Na_2SO_4, Na_2SO_4-$NaHCO_3$, celite H_2SO_4, anhydrous Na_2SO_4, activated silica gel, and another layer of anhydrous Na_2SO_4 and used in conjunction with a Florisil chromatographic column. Vegetables were homogenized, extracted with a 3:1:1 mixture of hexane: acetone: methanol, evaporated, then re-dissolved in octane prior to analysis. The average recovery ranged from 66.6 to 79.8% for additions of 1 ppt and from 46.6 to 66.4% for additions of 0.5 ppt TCDD.

81-1164. Ha, Y. D.; Bergner, K. G. (Inst. Lebensmittelchem., Univ. Stuttgart, D-7000 Stuttgart, BRD) **Duennschichtchromatographische Untersuchung von Phenylharnstoff- und *N*-Phenylcarbamat-Rueckstaenden in Moehren, Kartoffeln und Wein. I Mitteilung. Nachweis und Identifizierung der Wirkstoffe. [TLC determination of phenylurea and *N*-phenylcarbamate residues in carrots, potatoes, and wine. Part I. Detection and identification of the active ingredients.]** *Dtsch. Lebensmittel Rundsch.* 76(11): 390-394; 1980 (22 references) (German).

A TLC method was developed for the detection and determination of residues of diuron, linuron, monolinuron, chlortoluron, metobromuron, propham, chlorpropham, swep, and phenmedipham in carrots, potatoes and wine. The active substances are extracted from the sample and are subjected to TLC without additional clean-up: clean-up for carrots is advised, though. The active ingredients are hydrolyzed with a 7% methanolic solution of potassium hydroxide directly at the starting point to form the respective aniline derivatives. The spray reagent used is an acetone fluorescamine solution. The hR_f values determined were: 53.3 for propham, 54.0 for chlorpropham, 42.7 for swep, 25.3 for phenmedipham, 15.0 for diuron, 41.3 for linuron, 39.7 for

monolinuron, 41.0 for metobromuron, and 16.7 for chlortoluron. A two-dimensional TLC is recommended for visual evaluation, but better sensitivity is achieved by means of TLC spectrometry, which requires a one-dimensional chromatograph. If propham and phenmedipham, which are hard to separate from each other, are expected in the same sample, the sample solution should be applied on the plate together with reference solutions of the respective substances, and benzene: methanol (95:5) should be used as the solvent system. The above substances can be detected at a limit of 0.1 ppm in potatoes, carrots and wine.

81-1165. Busch, K. L.; Henis, N. B. H.; Bursey, M. M. (Environ. Chem. Branch, NIEHS, Research Triangle Park, NC 27709) **High pressure negative ion mass spectra of organometallic compounds.** *Environ. Health Perspect.* 33: 346; 1979.

Negative ion mass spectra were obtained for a number of organometallic compounds, including porphyrins, dialkyldithiophosphates, and triphenyltins. The negative ion mass spectra of octaethyl porphyrin derivatives contained both M^- and $(M+1)^-$ ions, and no fragment ions. The spectra of tetraphenyl prophine derivatives contained an $(M+1)^-$ ion, but no M^-. The tetraphenyl cadmium compound spectrum contained a peak $(LH)^-$, and the lead derivative spectrum contained a peak for a metal exchange reaction. Several nickel dialkyldithiophosphates were investigated, as well as triphenyltin compounds. In the scope of this limited study, variation of the substituent on the ligand did not affect the response in negative ion analysis. Responses of nickel or platinum compounds were similar. The sensitivity of the chemicals was such that detection of 1 ng of compound could be accomplished by selected ion monitoring, and 50-100 ng of a compound was sufficient for scanning mass spectra.

81-1166. Fawkes, J.; Walters, D. B.; McKinney, J. D. (Environ. Chem. Branch, NIEHS, Research Triangle Park, NC 27709) **Neutron activation analysis of organically bound chlorine. Precautions to minimize extraneous halide contamination in collection, storage, and analysis of human milk and formula.** *Environ. Health Perspect.* 33: 347; 1979.

An attempt was made by 3 North Carolina hospitals to correlate the amounts of PCB and DDE in human breast milk and effects on newborns. The development of a neutron activation analysis method for organochlorine compounds and possible sources of extraneous halide contamination, such as sample collection, handling, storage and cleanup, are discussed. Separation of inorganic chlorine as sodium chloride from organically bound chlorine was achieved by eluting the milk sample through a Bio-Gel P-2 column prior to neutron activation.

81-1167. Kohli, K. K.; Albro, P. W.; McKinney, J. D. (Environ. Chem. Branch, NIEHS, Research Triangle Park, NC 27709) **Radioisotope dilution assay (RIDA) for the estimation of polychlorinated biphenyls (PCBs).** *Environ. Health Perspect.* 33: 347; 1979.

Total PCBs were estimated in rat liver and cotton seed oil by a radioisotope dilution assay. Samples were spiked with a radioactive PCB, and subsequently extracted with chloroform:methanol, 2:1, v/v. PCBs and lipids were thus obtained. Samples rich in lipids were cleaned by gel permeation chromatography or sulfuric acid treatment. PCB fractions still showed contamination upon perchlorination and subsequent gas chromatography and hence further cleanup was achieved by chromatographing the samples on Florisil PR-60. Cleaned samples were perchlorinated. The radioactivity of the products was calculated and decachlorobiphenyl was estimated by gas chromatography with electron capture detector. Complete recovery of PCBs is not required for their estimation. The usefulness of this method for biological and nonbiological materials is suggested.

81-1168. Piet, G. J.; Slingerland, P.; Bijlsma, G. H.; Morra, C. (Natl. Inst. Water Supply, NL-2260 AD Leidschendam, The Netherlands) **Fast quantitative analysis of a wide variety of halogenated compounds in surface-, drinking- and ground-water.** *Environ. Sci. Res.* 16: 69-80; 1980 (10 references).

A monitoring system for a wide variety of organochlorine compounds is described. The system is used to analyze surface water used as a raw water source for drinking water production, polluted rain water in the neighborhood of open water storage reservoirs, groundwater destined for human consumption and finished potable water. The system provided fast quantitative analysis at the μg/l level using a glass capillary column coupled to an electron capture detection on-line with a flame ionization detector. Very accurate retention indices and the signal ratio numbers of the ECD and FID detector allow confirmation of individual organohalogen compounds in complex mixtures. A splitless injection system and a technique to avoid base line drift during temperature programming allow a wide variety of halogens from chlorobenzene to the PCBs to be analyzed in one straight run. A direct head-space procedure is also provided which allows compounds such as trihalomethanes, trichloroethane and others to also be analyzed. Analytical results of studies of the Rhine River and tapwater derived from surface water are reported.

81-1169. Chau, A. S. Y. (Environ. Canada, Burlington, Ontario, Canada) **Analysis of mirex in lake sediments: problems and solutions.** *Environ. Sci. Res.* 16: 141-144; 1980 (23 references).

The separation of mirex from PCBs and confirma-

tion of mirex in sediment samples are discussed. Sediment samples are extracted in the presence of activated copper powder by an ultrasonic apparatus using acetone: hexane and the hexane extract is passed through a florisil column. The first fraction contains PCBs, mirex, and photomirex, and is further treated by a micro-charcoal-foam column to separate PCBs from these constituents. The recoveries of all the determinants from spiked lake sediments were at least 90%. Recoveries of mirex, photomirex, and PCBs from sediment were 100%, 95%, and 100%, respectively. Three procedures are cited for mirex identification, each giving a predominant peak at a different retention time on a 3% OV-101 column.

81-1170. Pirbazari, M.; Herbert, M.; Weber, W. J., Jr. (Water Resour. Program, Univ. Michigan, Ann Arbor, MI 48109) **Evaluation of analytical techniques for assessment of treatment processes for trace halogenated hydrocarbons.** *Environ. Sci. Res.* 16: 217-230; 1980 (10 references).

Three major factors govern the validity of an analytical technique for the detection of contaminants in water: the type of detector system employed; the method used for collecting and concentrating the sample; and the type of system to which sample collection and analysis is applied. Several analytical techniques used for halomethane determinations are discussed including: dynamic headspace; static headspace; liquid-liquid extraction; and aqueous injection. Adsorption methodologies for halomethanes, including equilibrium and rate studies, are discussed. Analytical techniques for halomethanes are also evaluated in conjunction with adsorption methodologies. Adsorption methodologies for chlorinated hydrocarbons (PCBs, dieldrin and dichlorobenzene) are discussed including equilibrium and rate studies. A rapid and sensitive extraction technique that can satisfactorily replace cumbersome multiple extraction procedures for chlorinated hydrocarbons in adsorption experiments is discussed.

81-1171. Devenish, I. W.; Harling-Bowen, L. (South. Water Auth., Worthing, Sussex, England) **The examination and estimation of the performance characteristics of a standard method for organochlorine insecticides and PCB.** *Environ. Sci. Res.* 16: 231-253; 1980 (10 references).

The suitability and performance characteristics of a draft method, proposed for the examination of organochlorine insecticides and PCBs in water, were investigated. The method describes two means of extraction, a shaking technique and a rolling technique. The method calls for shaking the sample with hexane, then separating the layers and concentrating them to 1 ml. Most extraneous co-extractants are removed by passing the sample through columns of alumina and alumina impregnated with silver nitrate. Hexane is again used to elute the material from the column. Gas chromatographic examination of an aliquot of the concentrated cleaned extract may determine if partition is necessary to separate some insecticides from the PCB. Partition is achieved with silica gel. The column is eluted with a mixture of diethyl ether and hexane. Fraction I contains aldrin, *p,p'*-DDE and PCB, while fraction II contains γ-HCH (lindane), dieldrin, *p,p'*-TDE and *p,p'*-DDT. Each fraction is concentrated and the concentrate examined by gas-liquid chromatography.

81-1172. MacKinnon, M. D.; Hardstaff, W. R.; Jamieson, W. D. (Atlantic Reg. Lab., Natl. Res. Counc. Canada, Halifax, Nova Scotia B3H 3Z1, Canada) **A system for the preparation of organohalogen reference materials with marine lipid matrices.** *Environ. Sci. Res.* 16: 255-263; 1980 (5 references).

Natural herring oil was cleaned of organochlorine compounds by vacuum stripping after hydrogenation. The cleaned lipid was then dissolved in redistilled n-hexane. Concentrated hexane solutions of highly purified commercially prepared analytes of lindane, β-BHC, aldrin, heptachlor epoxide, DDE, DDD (TDE) and DDT were also obtained. Solutions containing the lipid plus the analytes dissolved in hexane were placed in glass reservoirs. Aliquots were transferred to 10 ml glass ampuls by a stainless steel filling apparatus. After 2.0 ml of n-hexane was flushed through the sample loop, the ampul was flame sealed. Samples were analyzed by gas chromatography using electron-capture detection. Average recoveries were 96 ± 8% and the average coefficient of variation was 6.2 ± 0.77. Some *p,p'*-DDE was lost from sampler stored in light. The method is suitable for assessing precision and accuracy of extracted lipids.

81-1173. Harrison, A. G. (Dep. Chem., Univ. Toronto, Toronto, Ontario M5S 1A1, Canada) **Chemical ionization mass spectrometry of hydrocarbons and halohydrocarbons.** *Environ. Sci. Res.* 16: 265-283; 1980 (42 references).

This review considers both positive and negative ion chemical ionization. Major emphasis is given to studies involving hydrocarbons and halohydrocarbons including aldrin, chlordane, mirex, BHC, and DDT. The results indicate that negative ion chemical ionization spectrometry is a useful addition to the collection of ionization techniques. The sensitivity of this method is at least as great as positive ion CI and, in many cases, may be substantially larger. The ability to generate intense molecular or pseudo-molecular anions can be particularly useful in quantification at low concentration levels. There also appears to be a distinct possibility of developing ionization reactions which are specific to certain molecules or classes of molecules.

81-1174. Beggs, D. (Hewlett-Packard Co., Palo Alto, CA 94303) **Automatic analysis of organic pollutants in**

water via GC/MS. *Environ. Sci. Res.* 16: 303-314; 1980 (7 references).

A Hewlett-Packard 5992A GC/MS system was used for analysis of organic pollutants in water including purgeable organic compounds, acid extract, base/neutral extract, and pesticides. Positive identification is achieved through the use of a fast, accurate library search routine. Additional confirmation can be achieved by comparison of relative retention times. Accurate quantification results from the ability to compare responses of contaminants to the response of an internal standard. The high sensitivity of the technique enables positive identification to be made of compounds at levels below 1 ppb.

81-1175. Joshipura, P. B.; Keliher, P. N. (Chem. Lab., Supply Cent., US Navy, Portsmouth, VA 23703) **Chlorinated phenolic compounds: formation, detection and toxicity in drinking water.** *Environ. Sci. Res.* 16: 453-460; 1980 (13 references).

A comparison study was performed between the UV ratio spectrophotometric system and the standard ASTM (4-AAP) method for the determination of chlorinated phenolic compounds. Calibration curves for different chlorophenols under two different sets of conditions are presented. Errors in interpreting concentrations of different chlorophenols, as 2,4-dichlorophenol, are listed. When chlorination of water containing phenol is performed the major chlorinated products observed are 2-chlorophenol and 4-chlorophenol, with a very small amount of 2,4-dichlorophenol present initially. The amount of 2,4,6-trichlorophenol formed is negligible. The standard ASTM method reports small concentrations of chlorinated phenols in chlorinated water due to negative errors for both 2-chlorophenol and 4-chlorophenol. The UVRS method, however, will give higher concentrations of chlorinated phenols due to the error only for 4-chlorophenol. The UVRS method, optimized for 2,4-dichlorophenol, should be closer to actual concentration levels than the standard method. In drinking water samples the concentrations from each method were similar.

81-1176. Abdel Monem, A. H.; Mumma, R. O.* (Dep. Entomol., Pestic. Res. Lab., Pennsylvania State Univ., University Park, PA 16802) **Development of an analytical procedure for an insect growth regulator (EL-494) employing high-pressure liquid chromatography and its application on residues in alfalfa.** *J. Agric. Food Chem.* 29(1): 75-78; 1981 (6 references).

A procedure was developed for the analysis of an insect growth regulator (EL-494) employing high-pressure liquid chromatography (LC). The plant tissue was washed and extracted with acetone. The extract was concentrated and clean up by using a Florisil column. The concentrated eluate was analyzed by high-pressure LC employing a μBondapak C18 column and a methanol-water solvent system. EL-494 was detected by ultraviolet adsorption and the lower limit of detection was 10 ng. For demonstration of the practical application of this procedure, samples of alfalfa, field treated with a 50% wettable powder formulation of EL-494 at three concentrations (283.5, 567.0, and 1134.0 g AI/ha), were analyzed over a 9-wk period. Recoveries of spiked samples varied from 94.9 to 96.2% EL-494 (from 50 to 5000 ng) with a lower limit of detection of 0.025 ppm. (Author abstract reprinted by permission of the American Chemical Society)

81-1177. Smith, A. E. (Res. Stn., Agric. Canada, Regina, Saskatchewan S4P 3A2, Canada) **Comparison of solvent systems for the extraction of atrazine, benzoylprop, flamprop, and trifluralin from weathered field soils.** *J. Agric. Food Chem.* 29(1): 111-115; 1981 (44 references).

The extraction of atrazine, benzoylprop-ethyl, flamprop-methyl, and trifluralin from 3 field soils that had received treatments of the individual herbicides 12 mo previously was compared by using different solvent systems. The highest recoveries of atrazine were achieved by using 30% aqueous acetonitrile, at a pH of 9.0, as the extractant. Acetonitrile containing 30% water and 2.5 glacial acetic acid proved satisfactory for the extraction of benzoylprop-ethyl and flamprop-methyl, together with benzoylprop acid and flamprop acid, their respective soil-hydrolysis products. This extraction solvent, methanol, and 10% aqueous acetonitrile were all suitable for the extraction of trifluralin from treated soils. Prewetting of the soils for 18 hr before extraction did not result in significantly greater recoveries of benzoylprop-ethyl, benzoylprop acid, flamprop-methyl, flamprop acid, or trifluralin than could be obtained by direct extraction. (Author abstract reprinted by permission of the American Chemical Society)

81-1178. Chiba, M. (Res. Stn., Agric. Canada, Vineland Station, Ontario LOR 2EO, Canada) **A rapid colorimetric method for analysis of carbaryl spray deposits on fruit tree foliage.** *J. Agric. Food Chem.* 29(1): 118-121; 1981 (12 references).

A rapid colorimetric method was developed to determine deposits of carbaryl insecticide on fruit tree foliage. Analyses take less than 3 min/sample when 50 or more samples are processed at a time. A 5 cm^2 disk punched from a leaf is used for the determination. Carbaryl is extracted and hydrolyzed by methanolic NaOH (0.03% w/v) and then coupled with *p*-nitrobenzenediazonium tetrafluoroborate which produces a spectrum of colors ranging from red to blue. Within a concentration range of 0.5-10 μg/cm^2 of leaf surface or 0.25-5 μg/ml of alkaline solution in a test tube, the absorbance of color obeyed Beer's law when measured at 580 nm. Little, if any, interference was observed from other commonly used pesticides, such as dicofol, tetradifon, azinphos-methyl,

phosmet, captan, and folpet. If a spectrophotometer is not available or when a rapid field test is required, a semiquantitative determination is also possible. (Author abstract reprinted by permission of the American Chemical Society)

81-1179. Holt, R. F. (Exp. Stn., Res. Div., Biochem. Dep., Wilmington, DE 19898) **Determination of hexazinone and metabolite residues using nitrogen-selective gas chromatography.** *J. Agric. Food Chem.* 29(1): 165-172; 1981 (4 references).

Residues of the weed killer 3-cyclohexyl-6-(dimethylamino)-1-methyl-1,3,5-triazine-2,4(1*H*,3*H*)-dione (hexazinone) and two primary metabolites (A and B) in plants, animal tissues, and soil are determined by initial extraction with chloroform, cleanup by liquid/liquid partitioning techniques, and measurement by nitrogen-selective gas chromatography after reaction of the metabolites with trifluoroacetic anhydride. Additionally, by modification of the extraction scheme, two minor metabolites (D and E) can also be detected. A fifth metabolite (C) can be determined through a separate isolation procedure. Relative to a 25 g sample, method sensitivity is 0.04 ppm for the parent compound and metabolites A and B, 0.1 ppm for metabolites D and E, and 0.2 ppm for metabolite C. (Author abstract reprinted by permission of the American Chemical Society)

81-1180. Mount, M. E.; Oehme, F. W. (Comp. Toxicol. Lab., Kansas State Univ., Manhattan, KS 66506) **Microprocedure for determination of carbaryl in blood and tissues.5** *J. Anal. Toxicol.* 4(6): 286-291; 1980 (11 references).

The extraction of carbaryl from blood and tissues of animals poisoned with the insecticide is described. The method calls for ball-mill extraction using acetone and methylene chloride, removal of lipid material by a freeze-out procedure, and florisil microcolumn cleanup. A carbaryl derivative is formed with heptafluorobutyric anhydride in the presence of trimethylamine. Rapid processing for gas-liquid chromatographic separation on 3% OV-17 and electron-capture detection were carried out. Carbaryl could be detected to 0.02 ppm for blood and 0.1 ppm for tissue. The procedure allowed simultaneous processing and sensitive detection of carbaryl in numerous small samples.

81-1181. Kurhekar, M. P.; Pundlik, M. D.; Meghal, S. K. (Reg. Forensic Sci. Lab., Nagpur 440012, India) **Confirmation of parathion, methyl parathion and fenitrothion in biological material on thin-layer plates.5** *J. Anal. Toxicol.* 4(6): 322-323; 1980 (10 references).

A confirmatory procedure for the organophosphorus insecticides containing a nitro group is presented. Parathion, methyl parathion and fenitrothion in hexane were spotted on a pre-activated thin-layer plate and allowed to dry. The spots were covered with 2-3 drops of the derivatizing reagent and the plate was heated at 100°C for 10 min. After cooling, 5 μg parent compound were separately spotted on the same plate. The plate was then developed in a previously saturated chamber using hexane: acetone: ethanol (6:2:2, v/v/v). After a 12 cm run, the plate was removed and dried at room temperature. It was then sprayed with mercuric nitrate followed by diphenylcarbazone. Spots of the reduction product were eluted with ethanol and the extract was subjected to a conventional test of diazotization for confirmation of an amine. Parathion, methyl parathion and fenitrothion had R_f values of 0.92, 0.87 and 0.84, respectively. After treatment with the derivatizing reagent, each parent compound had two spots; the unconverted compound and the amino derivative.

81-1182. Kapoor, S. K.; Chawla, R. P.; Kalra, R. L. (Dep. Entomol., Punjab Agric. Univ., Ludhiana 141004, India) **Simplified method for estimation of DDT and hexachlorocyclohexane residues in milk.** *J. Assoc. Off. Anal. Chem.* 64(1): 14-15; 1980 (7 references).

A procedure that combines acetone-hexane extraction and cleanup by treatment with concentrated sulfuric acid is described for determining DDT and 1,2,3,4,5,6-hexachlorocyclohexane (HCH; BHC) residues in milk. Recoveries from samples fortified with 0.004-0.008 ppm of different HCH isomers and 0.01-0.02 ppm DDT and its metabolites ranged from 83.4 to 99.8%. The proposed method is simple and rapid, and does not require the use of costly adsorbents. (Author abstract by permission)

81-1183. Nowicki, H. G. (Adv. Org. Meas. Group, Calgon Anal. Lab., Calgon Corp., Pittsburgh, PA 15230) **Application of azulene as visual aid to monitor column chromatographic fractionation of samples for pesticide and polychlorinated biphenyl determination.** *J. Assoc. Off. Anal. Chem.* 64(1): 16-18; 1980 (7 references).

Azulene is proposed as a real-time column performance monitoring agent for samples cleaned up for pesticide analysis. Environmental samples are cleaned up by Florisil column chromatography, using azulene as a visual aid to monitor column performance. Azulene migrates as a blue band in the 6% ethyl ether-hexane fraction, and the gas chromatograph electron capture detector (GC-ECD) is nonresponsive at the use concentration. The method complements the standardization of Florisil columns by weight adjustment based on adsorption of lauric acid. Spiking of sample with azulene provides a convenient real-time monitor for column channeling, mistakes in polarity of mobile phases, particular sample composition, column overloading, and dynamic changes in the adsorptivity of the stationary phase between lauric acid calibra-

tion and use. Using this visual aid, the analyst is alerted to unexpected column behaviors. Normally, polychlorinated biphenyls (PCBs) elute in the 6% fraction, in front of the blue indicator. Experiences with azulene and industrial effluent samples demonstrated that PCBs can elute in the 100% hexane fraction. GC-ECD analysis of the hexane eluate revealed a PCB characteristic chromatogram, not observed with the original extract. Thus, monitoring column performance avoided reporting a false negative result, i.e., no PCBs in the 6% ethyl ether-hexane fraction. (Author abstract by permission)

81-1184. Ray, A. C.; Post, L. O.; Reagor, J. C. (Texas Vet. Med. Diagn. Lab., Texas A&M Univ., College Station, TX 77841) **High pressure liquid chromatographic determination of sodium fluoroacetate (Compound 1080) in canine gastric content.** *J. Assoc. Off. Anal. Chem.* 64(1): 19-24; 1980 (10 references).

A sensitive high pressure liquid chromatographic method was developed for the determination of sodium fluoroacetate (Compound 1080) in canine gastric content. The procedure involves extraction of 1080 with water, methyl ethyl ketone, and dilute base, followed by sample cleanup using octadecylsilane bonded phase cartridges and derivatization in ethyl acetate solution with *O-p*-nitrobenzyl- *N,N'*-diisopropylisourea (PNBDI). The compound was chromatographed on a 10 μm silica column, and ultraviolet absorbance at 254 and 280 nm was measured. Recovery was greater than 95% for standard 1080 and in the 70-90% range for spiked samples (1-50 ppm). (Author abstract by permission)

81-1185. Sanchez Rasero, F. (Estac. Exp. Zaidin, Secc. Quim. Anal., Granada, Spain) **Atomic absorption spectrophotometric method for determination of water-soluble copper in water-insoluble copper fungicides; CIPAC collaborative study. Comparison with bathocuproine method.** *J. Assoc. Off. Anal. Chem.* 64(1): 75-78; 1980 (5 references).

An atomic absorption spectrophotometric (AAS) method was collaboratively studied by 8 laboratories from Africa, the United States, Australia, and Europe. The samples were dispersed in deionized water. After centrifuging and filtering, the water-soluble copper in the filtrate was acidified and measured by atomic absorption spectrophotometry, in an air-acetylene flame, 324.7 nm. The results from 7 laboratories were satisfactory and no unfavorable comments were received. Repeatability standard deviations ranged from 0.005 to 0.023, and reproducibility standard deviations ranged from 0.012 to 0.062. When compared with the bathocuproine method, the difference in bias between both methods is not significant. They were both adopted as full CIPAC methods, with the bathocuproine method as the referee method. Both methods have been adopted official first action. (Author abstract by permission)

81-1186. Roseboom, H.; Herbold, H. A. (Unit Residue Anal., Natl. Inst. Public Health, NL-3720 BA Bilthoven, The Netherlands) **Determination of triazine herbicides in various crops by capillary gas chromatography with thermionic detection.** *J. Chromatogr.* 202(3): 431-438; 1980 (9 references).

The qualitative and quantitative analysis of triazine herbicides by gas chromatography was studied using packed and capillary columns, combined with either an electrolytic conductivity detector or a thermionic detector. The thermionic detector was found to be about 10 times more sensitive than the electrolytic conductivity detector; with a capillary column the sensitivity was about 5 times greater than with a packed column. The best separation between the triazines was obtained on a capillary column, coated with OV-225 or Carbowax 20M. The former column has the disadvantage of giving a very high background signal on the thermionic detector, so the best results were obtained with a capillary column, coated with Carbowax 20M, using a thermionic detector. In this system 7 widely used triazines were easily separated completely, while the detection limit was about 10 pg. The same system was used for a determination of triazine herbicides in various crops. The samples were first macerated with dichloromethane and the extracts then analyzed as above, if necessary after clean-up over a silica gel column. The clean-up is necessary for the various kinds of cabbage, but not for other crops, such as onion and leek. The recovery of the triazines is generally around 100% in the concentration range studied (0.02-1.0 mg/kg), and the limit of detection is less than 0.01 mg/kg. (Author abstract by permission)

81-1187. Games, D. E.; Hirter, P.; Kubnz, W.; Lewis, E.; Weerasinghe, N. C. A.; Westwood, S. A. (Dep. Chem., Univ. Coll., Cardiff CF1 1XL, England) **Studies of combined liquid chromatography – mass spectrometry with a moving-belt interface.** *J. Chromatogr.* 203: 131-138; 1981 (27 references).

The advantages and limitations of a moving-belt interface for liquid chromatography-mass spectrometry are discussed using examples of combined liquid chromatography-mass spectrometry of natural coumarins, alkaloids, rotenoids, sugars, nucleosides, peptides and pesticides [including the carbamate herbicide CIPC (chlorpropham)] and drugs and their metabolites. Preliminary data obtained using a micro high-performance liquid chromatograph interfaced to the moving belt are reported. (Author abstract by permission)

81-1188. Tsukerman, V. G. (Alma-Ata Branch, TsINAO, Alma Ata, USSR) **Opredelenie izomerov geksakhlorotsiklogeksana i khlortriazinov v pochve. [Determination of hexachlorocyclohexane and chlorotriazine isomers in soil.]** *Khim. Sel'sk. Khoz.* 18(10): 51-52; 1980 (10 references) (Russian).

A chromatographic method of determination of isomers of hexachlorocyclohexane (HCCH; BHC) and chlorotriazine herbicides (simazine, atrazine, and propazine) in soil is described. The most effective extraction of pesticides from soil samples was achieved by solvent mixtures containing of acetone (acetone:hexane, acetone:petroleum ether, acetone:chloroform, and acetone:benzene at 1:4 ratio). Sensitivity of determination was 0.001 mg/kg for α and γ isomers of HCCH (α-BHC and lindane), 0.06 mg/kg for β-isomer of HCCH (β-BHC) and 0.01 mg/kg for chlorotriazines.

81-1189. Girenko, D. B. (All-Union Res. Inst. Hyg. & Toxicol., USSR) **Gazokhromatograficheskoe opredelenie ronstara v vode i rasteniyakh. [Gas chromatographic determination of Ronstar in water and plants.]** *Khim. Sel'sk. Khoz.* 18(10): 52; 1980 (Russian).

A method for determination of the herbicide Ronstar (oxadiazon) 2-tert-butyl-4- (2,4-dichloro-5- isopropoxyphenyl) -Δ^2-1,3,4-oxydiazolinon- 5) in water and plant samples is reported. The method included extraction of herbicide with hexane solvent and gas-chromatography. Retention time for Ronstar was 4.5 min, compared with 1 min for lindane, 5.4 min for 4,4'-DDD (TDE) and 6.6 min for 4,4'-DDT. The minimal detectable amount of Ronstar in water and plants was 5 μg/l and 20-30 μg/kg. The recovery rate for Ronstar in water and plants was 89% and 72%, respectively.

81-1190. Petrova, T. M.; Andreev, Yu. B. (All-Union Inst. Plant Prot., Leningrad, USSR) **Opredelenie bazudina i dursbana v pochve i vode. [Determination of Bazudin and Dursban in soil and water.]** *Khim. Sel'sk. Khoz.* 18(10): 52-54; 1980 (11 references) (Russian).

A method for determination of organophosphorus insecticides Bazudin (diazinon) and Dursban (chlorpyrifos) in soil and water is reported. The method include insecticides extraction using hexane for water samples and acetone + aqueous solution of calcium chloride (1:1) for soil samples; reextraction with hexane, and thin-layer or gas chromatographic determination. Sensitivity of thin layer chromatography was 0.01 mg/l for water and 0.1 mg/kg for soil. Sensitivity of gas chromatographic determination of Bazudin was 0.001 mg/l for water and 0.02 mg/kg for soil (the corresponding values for Dursban were 0.0004 mg/l and 0.008 mg/kg).

81-1191. Pis'mennaya, M. V. (All-Union Res. Inst. Hyg. & Toxicol., USSR) **Opredelenie metilnitrofosa i ego metabolitov v zerne. [Determination of methylnitrophos and its metabolites in grain.]** *Khim. Sel'sk. Khoz.* 18(10): 54-55; 1980 (12 references) (Russian).

A method of determination of methylnitrophos (fenitrothion) and its metabolites in grain was developed. The technique consists of chromatographic identification of methylnitrophos and its metabolites by a reduction of nitro-group in a thin layer of silica gel containing zinc, with subsequent coupling of the amino compound with *p*-dimethylaminebenzaldehyde. A mixture of n-hexane with acetone at 4:1 ratio was used as a mobile phase. Sensitivity of the method is 2 μg (0.1 mg/kg) for methylnitrophos and fenitro-oxon and 0.1 μg (0.005 mg/kg) for *p*-nitrocresol.

81-1192. Ofstad, E. B. (Author address not given) **Gode erfaringer med kapillarkolonne kromatografi til miljokemi analyser: Glasskapillarkolonner – et stort fremskritt. [Good experience with capillary column chromatography in environmental chemical analysis: glass capillary column – a major improvement.]** *Kjemi* 40(11): 28-31; 1980 (10 references) (Norwegian).

Experience with glass capillary column chromatography is described. This method was used to determine organochlorine pesticides and PCBs in identical fish oil samples at 6 laboratories. The variation in results was found to be narrower than by the conventional column chromatographic method: 52-80 ppb for hexachlorobenzene, 48-131 for α-BHC, 6-136 ppb for lindane, 64-90 ppb for dieldrin, 11-116 ppb for *p,p'*DDE, 36-79 ppb for *p,p'*-DDD (*p,p'*-TDE), 30-171 ppb for *p,p'*-DDT and 270-1300 ppb for PCBs. It was possible to separate α-BHC and hexachlorobenzene from each other by decreasing the starting temperature from 130°C to 60°C and reducing the heat-up rate from 8 to 2°C/min to an end temperature of 210°C instead of 230°C.

81-1193. Schreiber, H. (Author address not given) **Nachweis und Bestimmung von Pflanzenschutzmittelruechstaenden. II. [Detection and determination of plant protectant residues. II.]** *Lernen Leisten* (6): 61-63; 1979 (German).

A method for the determination of organochlorine pesticide residues in cocoa and milk powder is described. After isolation of the fat with petroleum ether, the extract is mixed with celite and the pesticides are extracted with propylene carbonate in a chromatographic column. The solution obtained is eluted with cyclohexane in a second column containing alumina and Florisil. Gas chromatography with an electron capture detector (ECD) or thermionic detector (TID) is used for the determination from the eluate. The pesticides were (DDT, BHC, endrin, dieldrin, chlordane, heptachlor and aldrin) identified on the basis of their retention times.

81-1194. Sprague, G. L.; Sandvik, L. L.; Bickford, A. A.; Castles, T. R. (Toxicol. Dep., Stauffer Chem. Co.,

Richmond, CA 94804) **Evaluation of a sensitive grading system for assessing acute and subchronic delayed neurotoxicity in hens.** *Life Sci.* 27(25-26): 2523-2528; 1980 (8 references).

Hens treated acutely with tri-o-tolyl phosphate (TOTP or TOCP) or subchronically with diisopropyl fluorophosphate (DFP) were used in studies designed to develop a grading system for evaluation of delayed neurotoxicity. Hens were walked and scored at regular intervals during treatment. In addition, nerve specimens were examined histologically to confirm the occurrence of delayed neuropathy. The walking behavior system was also compared with a clinical neurotoxicity system. After a single dose of 500 mg/kg TOCP, the walking behavior system detected neurotoxicity at 7 days, but the clinical neurotoxicity system did not. In hens treated for 20 days with 0.05 mg/kg/day DFP, both systems detected delayed neurotoxicity on day 5. All 7 hens showed histologic evidence of central-peripheral distal axonopathy and showed positive walking behavior scores, but only 5 of 7 had positive clinical neurotoxicity scores. In general, it was seen that both systems predict neuropathy, but the walking behavior system was more sensitive for acute studies. Both systems were equally sensitive for subchronic studies. It is suggested that the walking behavior system be tested further for use in assessing delayed neurotoxic potentials of organophosphate insecticides.

81-1195. Ivanov, Z.; Magee, R. J. (Dep. Inorg. & Anal. Chem., La Trobe Univ., Melbourne, Victoria 3083, Australia) **The determination of trace amounts of chlorophenols by high-performance liquid chromatography.** *Microchem. J.* 25(4): 543-547; 1980 (16 references).

A method of determining trace levels of 8 chlorophenols [pentachlorophenol (PCP); 2,3,5,6- and 2,3,4,5-tetrachlorophenol; 2,4,5-, 2,3,4-, 2,3,5-, 3,4,5- and 2,4,6-trichlorophenol] by high-performance liquid chromatography (HPLC) is presented. Following preliminary investigations it was determined that the best conditions for separating these compounds was with a 15 cm column and 1% methanol in petroleum spirit (40-60°C). Standards were used to prepare calibration curves from 0.1 to 1 ppm for each chlorophenol tested. Experimental unknowns were analyzed and identified by retention time comparisons. Separation of all 8 compounds used could be completed in 25 min.

81-1196. Saito, F.; Ariga, H.; Sukegawa, K. (Sch. Dairy Chem., Obihiro Zootech. Coll., Obihiro, Hokkaido, Japan) **[Determination of carbaryl residues by high speed liquid chromatography.]** *Nippon Koshu Eisei Zasshi (Jpn. J. Public Health)* 27(10): 645; 1980 (Japanese).

A method for determination of carbaryl residues in food is presented. Water or milk samples are extracted twice with benzene or toluene, the extract is dehydrated with anhydrous Na_2SO_4, and then the extract is dried to a solid. Vegetable samples are extracted with a mixture of methanol and acetone, acetonitrile is added once, the aqueous layer is extracted with chloroform, and after dehydration the chloroform extract is dried to a solid. The dried solid is dissolved in a mixed solvent of hexane-dichloromethane (1:1), and the solution is subjected to clean-up with a Florisil column. The solution is then dried to solid and redissolved. Determination is carried out using a Hitachi high speed liquid chromatogram model 635 provided with a 2.1 × 300 mm column with Hitachi-gel 3030. A 1:2 mixture of chloroform and hexane is used as the eluent at a flow rate of 1 to 1.5 ml/min. Pentachlorophenol (PCP) is used as an internal standard. The recovery of carbaryl was 96.0% from water and 98.7% from milk using toluene as the extractant. The lower limit of detection was 5 ng.

81-1197. Malaiyandi, M.; Blais, P.; Sastri, V. S. (Environ. Health Dir., Health Prot. Branch, Health & Welfare Canada, Ottawa, Ontario, Canada) **Separation of lindane from its aqueous solutions by reverse osmosis system.** *Sep. Sci. Technol.* 15(7): 1483-1488; 1980 (13 references).

A method of separating lindane from aqueous solutions by reverse osmosis is presented. Solutions of 6.8-8.0 mg lindane/l were made with purified water. Radial flow reverse osmosis (RO) cells and conventional cellulose acetate membranes were used. Flow of the feed solution was adjusted to obtain a recycled feed-to-product volume ratio of 4:1. For each run, 225 ml of feed solution permeated the membranes, and the solution was sampled and analyzed at the end of the run. Membranes were extracted to remove that portion of lindane that was retained. Initially, 36% and 24% ± 1.0% of the initial compound were retrieved by 2 cellulose acetate films in the recycled feed and permeative solutions. Up to 83.9 μg were, however, extracted from the membranes. Up to 10% of the pesticide was lost. Repeated washing procedures, however, eventually accounted for 73% of the pesticide in the membranes. This method was found to result in poor separation and contamination of membranes, which would then leach pesticide in subsequent tests.

81-1198. Francetic, V.; Veber, M.; Gomiscek, S. (Fac. Nat. Sci. & Technol., E. Kardelj Univ., Ljubljana, Yugoslavia) **The analytical chemistry of metal alkylenebisdithiocarbamates. I. The polarographic determination of ethylenebisdithiocarbamates in preparations for agriculture.** *Vestn. Slov. Kem. Drus.* 27(1): 27-37; 1980 (12 references).

The determination of ethylene*bis*dithiocarbamates with pulse polarography is described. The method is suitable for fast analysis of fungicidal preparations as well as for the study of the stability of the compounds in solu-

tion. For anodic polarography the supporting electrolyte is 0.1 *M* NaOH in 50% ethanol. The polarogram is recorded from −0.9 to −0.125 V *vs.* SCE. The precision and accuracy of the method are acceptable. While the compounds can be determined with all polarographic techniques, the most suitable are fast and pulse polarography for the determination of moderate and high concentrations and cathodic stripping by voltammetry for determinations of trace amounts. In the procedure, 0.40 g of sample is transferred to a 100 ml flask, which is then filled with 1 *M* solution and shaken. Part (0.2 ml) of the solution is poured into the polarographic cell and 20 ml supporting electrolyte added. After deaeration the polarogram is recorded. The drop time was 2 sec, the scan rate 2 mV/sec and sensitivity of 0.25 μA/cm.

81-1199. Veber, M.; Francetic, V.; Gomiscek, S. (Fac. Nat. Sci. & Technol., E. Kardelj Univ., Ljubljana, Yugoslavia) **The analytical chemistry of metal alkylenebisdithiocarbamates. II. The voltammetric determination of trace concentrations of alkylenebisdithiocarbamates in environmental samples.** *Vestn. Slov. Kem. Drus.* 27(2): 131-146; 1980 (7 references).

The use of cathodic stripping voltammetry to determine trace concentrations of alkylenebisdithiocarbamates in water, soil and plant samples is described. The supporting electrolyte is 0.1 *M* NaOH in 50% ethanol. Electrolysis should be performed at −0.25 V *vs.* the standard calomel electrode, and voltammograms recorded from −0.25 V to −1.0 V *vs.* the standard calomel electrode applying scan rates from 50 to 100 mV/sec. Two cathodic stripping peaks are noted at constant instrumental parameters rectilinear with regard to the concentration of carbamate in the solution. In order to carry out the determinations, prior extraction with 1 *M* NaOH is necessary. The procedure is about 10% precise and has satisfactory accuracy.

81-1200. De Beer, J.; Van Peteghem, C.; Heyndrickx, A. (Dep. Toxicol., State Univ. Gent, Gent, Belgium) **EC-GLC determination of the herbicidal monohalogenated phenoxyalkyl acid mecoprop in tissues, urine and plasma after derivatization with pentafluorobenzylbromide.** *Vet. Hum. Toxicol.* 21(SUPP): 172-177; 1979 (13 references).

A sensitive electron capture GLC method is described for analysis of phenoxy acids at the 0.1 to 2.0 ppm level in 1 ml urine and plasma or in 0.5 g post-mortem material such as liver and brain. Electron capture detection is highly sensitive for monohalogenated chlorophenoxyalkyl acids as the pentafluorobenzylester derivatives, so that the minimum detectable amount is about 5 pg. A test-tube micro-extraction method for detection of MCPP (mecoprop) in urine, plasma and homogenized tissues calls for acidification with hydrochloric acid followed by the derivatization of the residue and column clean-up over silica gel. [Presented at the joint annu. mtg. of the Eur. Poison Control Cent. and Int. Assoc. Forens. Toxicol.]

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